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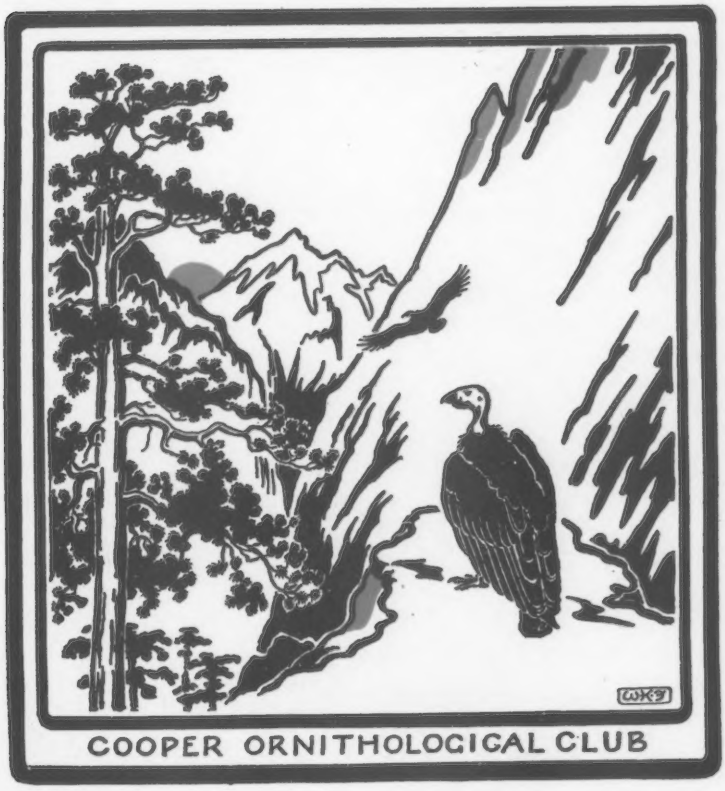

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CONTENTS

PAGE

Some Tagging Experiments with Black-footed Albatrosses.....*Loye Miller* 3

The Number of Eggs Laid by Cowbirds.....*David E. Davis* 10

The Fishing Activities of Double-crested Cormorants on San Francisco Bay.....*George A. Bartholomew, Jr.* 13

Four New Woodpeckers from the Western United States and Mexico.....*A. J. van Rossem* 22

Notes on Some Pelagic Birds of the Coast of British Columbia.....*Patrick W. Martin* 27

The Pterylosis of the Andean Condor.....*Harvey I. Fisher* 30

Additions to the Distributional List of the Birds of British Columbia.....*Allan Brooks* 33

FROM FIELD AND STUDY

Spotted Owl Nesting in Colorado.....*Samuel W. Gadd* 35

Another Wilson Snipe Perches on a Telephone Pole.....*E. Lowell Sumner, Jr.* 35

Green Heron at Tacoma, Washington.....*John W. Slipp* 35

Pigmy Nuthatch in Oklahoma.....*George Miksch Sutton* 36

Woodpecker Efficiency.....*P. A. Taverner* 36

Some New Bird Records from Oregon.....*Stanley G. Jewett* 36

The Black Pigeon Hawk in Colorado.....*Alfred M. Bailey* 37

A Raptor Tally in the Northwest.....*Aldo Leopold* 37

A Second Record for the Calaveras Warbler in the State of Montana.....*Robert W. Hiatt* 38

An Oligocene Hawk from Colorado.....*Alden H. Miller* and *Charles G. Sibley* 39

Black Swift in Orange County, California.....*Wilson C. Hanna* 40

Whooping Cranes in Texas in Summer.....*James O. Stevenson* 40

Trade Value of the Beak of the Ivory-billed Woodpecker.....*W. L. McAtee* 41

Starlings in Southern Utah.....*Russell K. Grater* 41

Golden Eagles Visit Northern Arizona Desert.....*Harold C. Bryant* 41

NOTES AND NEWS..... 42

PUBLICATIONS REVIEWED.

Ridgway and Friedmann's Part 9 of the Birds of North and Middle America.....*Alden H. Miller* 42

MINUTES OF COOPER CLUB MEETINGS..... 43

Museums
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1-23-42
Wilson Ornithological Club

THE CONDOR

VOLUME 44 JANUARY-FEBRUARY, 1942 NUMBER 1

SOME TAGGING EXPERIMENTS WITH BLACK-FOOTED ALBATROSSES

By LOYE MILLER

I reported in an earlier paper (Condor, 42, 1940: 229-238) some very limited results of first efforts at marking individual Black-footed Albatrosses (*Diomedea nigripes*) or "Goonies" off the coast of southern California. The long desired opportunity to renew this promising line of effort was afforded only this last summer on a week's cruise of the motor yacht "E. W. Scripps" of the Scripps Institution of Oceanography of the University of California. My sincere thanks are extended to Director H. U. Sverdrup of that institution for permission to take part in this cruise and likewise to Captain Earl Hammond and his genial crew for their hearty support of my varied activities while on board.

Six parallel lines were charted at approximately right angles to the general trend of the coastline from Santa Barbara, California, to northern Baja California, Mexico, and running across the continental shelf outward for about one hundred and fifty miles. The lines were thirty miles apart (fig. 1) and oceanographic stations were occupied at intervals of eighteen to twenty miles. Work was continuous day and night by the oceanographic watches (the ornithologist slept sometimes). Each station involved a stay of approximately two hours. During this time, if the stop was by day, chumming was done with galley waste or with prepared bait. The greatest gooney appeal was provided by bacon drippings which had congealed to semi-solid state.

To conserve this material and keep it more or less granulated, puffed rice was mixed with the warm fat before chilling. These grains were flung about with a big spoon. They floated conspicuously on the surface, and were small enough to keep the big birds busily occupied picking them up while I shifted to a paint swab and flung quick-drying oil paint over the plumage of the bolder individuals when they came near enough to the poop's overhang or to the skiff from which I sometimes worked. In this way twenty-five birds were rendered recognizable with white, green or red pigment. We were fortunate in having fairly calm weather in the off-shore zone frequented by the goonies. The almost frenzied interest developed by my improved bait helped to overcome the birds' customary dignified reserve, and the further fact that the ship was to be repainted at the end of the cruise conspired to further my efforts so that some interesting data were obtained.

The first goonies were encountered eight miles south of Santa Rosa Island (Station No. 13) where but three birds were attracted. They were not marked with pigment but were all birds of recognizable plumage characters.

None of them reported at Station 14, twenty miles south of San Miguel Island. Darkness prevailed from that point out to Station 17 where other methods of marking were tried without success. The method of spattering with paint was first practiced successfully at Station 28, eighty miles off San Nicolas Island in 2120 fathoms of water. Here sixteen birds came to my bait and seven individuals were marked with

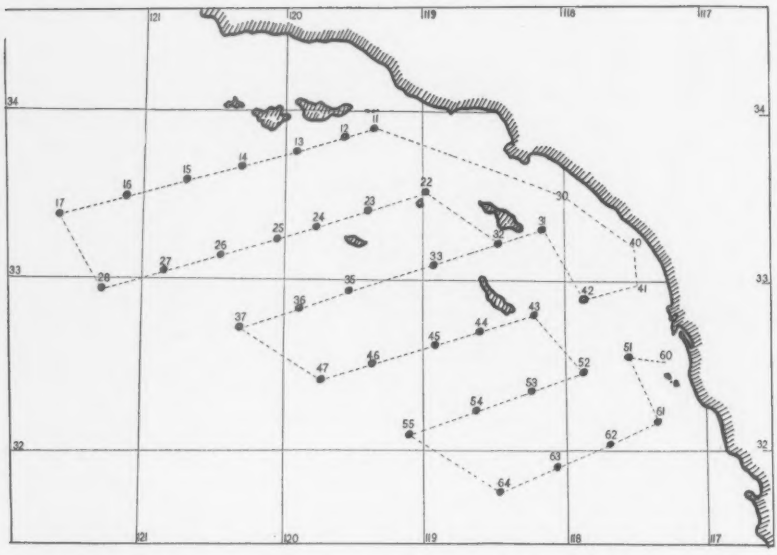

Fig. 1. Diagram of oceanographic stations occupied by the "E. W. Scripps" on the cruise on which Black-footed Albatrosses were marked. Coast line from Santa Barbara, California, to Ensenada, Lower California.

white enamel. From here we headed back landward again to Station 27. At this station only nine birds reported and three of the seven marked birds from twenty miles away (Station 28) were among them.

A gooney attacked a wounded petrel and laid open its scalp but did not go further. Petrels that were dropped lifeless were not noticed by the big goonies who could easily have swallowed them.

At dawn the next morning the boat was off Begg's Rock but no albatrosses appeared. At Station 23 we were off the east end of San Nicolas Island and a single albatross came to a pail of garbage. Here he was fraternizing at table with Western Gulls and Black Petrels. This gooney was unmarked but the watch on duty said that it followed to Station 22, four miles off Santa Barbara Island, which we reached about noon. This was probably true, for no other goonies appeared so far in on the continental shelf. We left this gooney here, however, as we headed southeast parallel with the mainland shore fifty miles away. He had plenty of reason to follow if he had so desired.

During the night we worked the eastern end of the third transect, going outward, and dawn found us at Station 35, which is eighteen miles southwest of San Nicolas Island. The overcast sky was scarcely lightened at 4:15, but when I threw a grapefruit rind overboard, a gooney loomed up out of the darkness to look it over. There is nothing phosphorescent about a grapefruit so the birds must see pretty well in the dark. Four goonies were about the ship while we proceeded southwestward to Station 36, which we occupied at 8:00 a.m. Within ten minutes I was able to assemble ten goonies by chumming with cold bacon drippings, and within an hour there were eighteen birds and I had successfully marked eight with white enamel. Bacon grease seems to throw

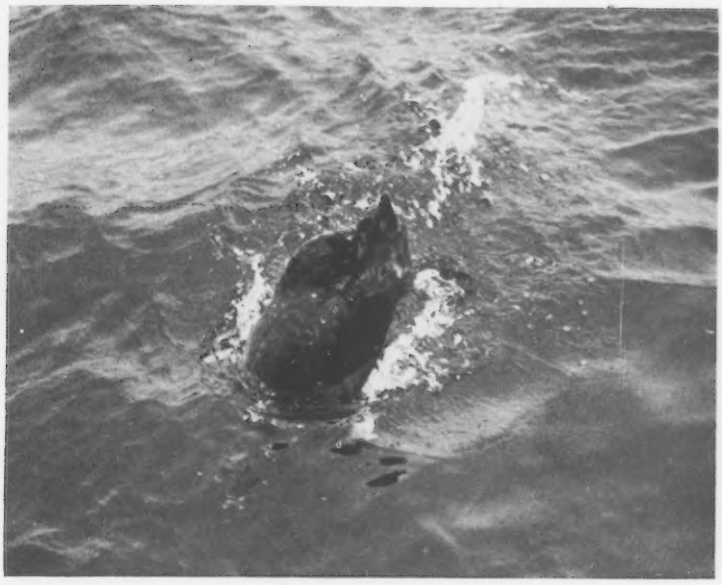

Fig. 2. Black-footed Albatross engaged in subsurface feeding by the tip-up method, with wings closed.

the birds almost into a frenzy. Some of them rushed right up under the overhang of the poop.

There was much bill washing and head ducking after my attempts to splatter paint had spread a slight film of the paint-flux on the water. Birds were able to distinguish instantly between this oil film and the bacon fat film on the surface, seemingly by the odor, before the beak had touched it.

We were now thirty-five miles southwest of San Nicolas Island, headed out to sea with two more stations to go by daylight. We arrived at Station 37 at 11:30 a.m. The first gooney that landed was a marked bird from eighteen miles away. In the first half hour thirteen birds assembled and three were marked birds from the previous station (No. 36). After lunch a further chumming brought the number of birds to twenty-two, and a total of five were marked birds. Here it is notable that these last two birds were over an hour coming in and three marked birds never turned up. Only one had been present when we hove to at the station. There appears to be some "grapevine telegraph" that brings birds in from considerable distances so that they arrive as much as an hour after the first chum is thrown out. These late birds are often the marked birds from twenty miles away.

From this point we turned southeast to Station 47, the outer point of our next transect, thirty miles away. We arrived at 5:00 p.m. and chumming was begun. Sixteen birds soon came about and one was a white-marked bird. After nearly an hour two more marked birds arrived. These individuals had been marked at Station 36. Our ship had traveled fifty miles and made an acute angle turn which brought us back within thirty-two miles of the point where birds were marked. Had the birds traveled fifty

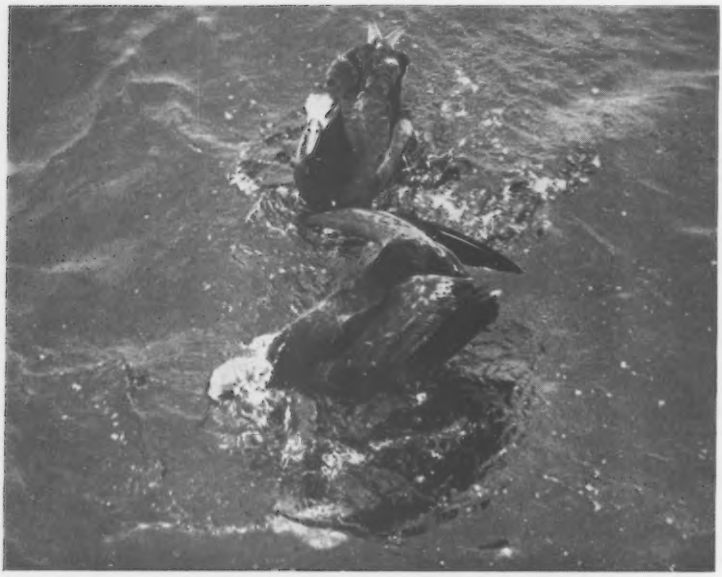

Fig. 3. Beginning of a dive, with wings raised.

Fig. 4. Albatross wholly submerged in dive, except for wing tips.

miles or only thirty-two? A total of twenty-five birds assembled at this station. We now turned back landward on a line parallel with the last and thirty miles distant, but nightfall put a stop to my watch for marked birds.

Next morning at Station 44 we were fourteen miles southwest of China Point, San Clemente Island. Six goonies were brought to chum and three were successfully marked with green paint. They were fortunately recognizable as individuals and numbered in my notes as 1, 2 and 3.

Our next station (43) was occupied at 10:00 a.m. and my first chumming brought three birds, none of which was marked. By 11:00, however, there were five birds and one of them was a bird (No. 1) marked with green paint twenty miles away. It had taken him an hour to discover us and travel that distance. This station was but five miles off the southeast point of San Clemente Island and was fairly close in for goonies. Still, one out of three marked birds had reported for food (1 hour late).

Again we made a southward tack for our next transect line at Station 52 where we started chumming with little result as to goonies for the first half hour. Then here came No. 1 from Stations 44 and 43. Half an hour late though he was, he came bowling right up to the rail and looked up at me with an attitude of readiness for a handout. Six birds were finally coaxed about but no other was recognized as a repeat.

About 6:00 p.m. we stopped at Station 53 and No. 1 was right on hand this time for his fourth meal at my expense. We had traveled seventy miles but had doubled back on our fifth transect line so that we were only thirty miles from the point where No. 1 had been marked and we had never been more than fifty miles away in a direct line. Nightfall stopped my observation and No. 1 was not seen again. This bird had actually traveled seventy miles in making the circuit; still, that is probably nothing as a jaunt for a gooney in surveying his territorial boundaries.

Our next daylight station was No. 64 at the outer end of the most southerly transect line, headed back toward the mainland. Here, by putting off in the skiff, seven birds were marked with red pigment. There was more wind blowing than on previous days and therefore greater difficulty in flinging pigment. Even while we were in the light skiff, with but twelve inches free board the birds did not like to allow us up wind from them. It blocked their line of take-off. They showed very little fear, however, and came within a foot of my spoon with which chum was thrown out. It was not difficult therefore to fling pigment on them.

We reached our next station, No. 63, at 11:30, and soon chummed eleven goonies, three of which had been marked with red paint at Station 64 at eight o'clock. The other four had dropped out of the picture. At three o'clock we were at station 62 and eighteen birds were chummed fairly promptly, one of which was marked thirty-six miles away. He had been so prompt and so eager at the previous two stations that he was christened "Old Bum." Here he came right up under the vessel's poop and looked up at my lunch counter on the rail. Once he almost caught the food in mid-air. Not until an hour had passed did another marked bird appear. Then three birds arrived, two of which were red splashed, making a total of three out of seven marked that morning at Station 64. There were now twenty-one birds about the ship but only eight or ten showed any particular interest in food. Others seemed to have come "just to be sociable."

Our next and last station of the cruise, No. 60, was occupied at sunset. Of the nine birds that came about before dark, one was "Old Bum," just as eager as ever and the last of the seven birds marked at Station 64, sixty miles away. This fellow holds the record for straight line traveling among my marked birds. He, however, gave some evidence of being a professional hanger-on who had more or less adapted his habit to

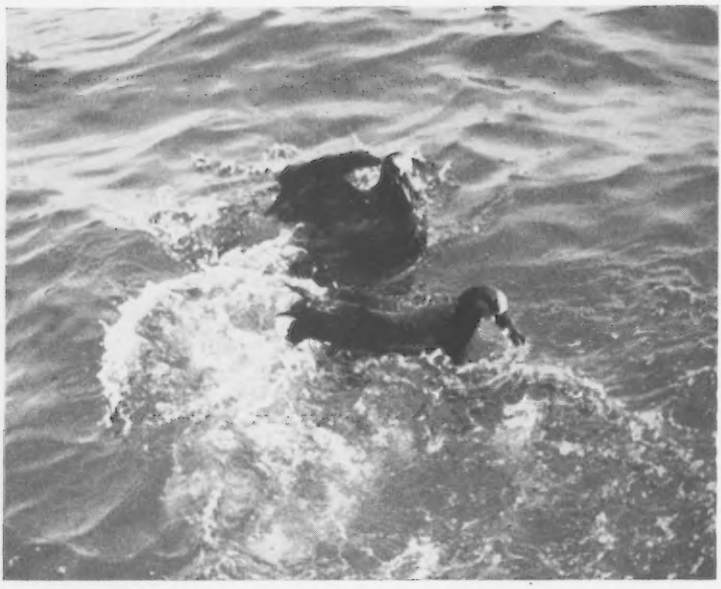

Fig. 5. Albatross in background has just emerged and is folding the wings and swallowing food.

the ways of man along the regular steamer lane that we had been following fairly closely all day into the port of San Diego.

SUMMARY AND CONCLUSIONS

1.—A total of twenty-five Black-footed Albatrosses were marked at sea off the coast of southern California. Of these twelve repeated at twenty miles, seven at thirty miles, three at forty miles and one at fifty and sixty miles (see fig. 6.).

2.—In watching the birds and making counts at the various stations it becomes evident that the large majority of individuals, even though they could not be marked, were not found at adjacent stations.

3.—A surprisingly large proportion of the birds showed little interest in the ship as a source of food and only a small proportion approached near enough to be marked.

4.—Marked birds in a number of cases probably attended the ship in transit. On the other hand, it was commonly true that marked birds arrived only after the ship had been stopped for thirty to sixty minutes, that is, they came from a considerable distance. There seemed to be some communicable interest transmitted by some means not entirely clear to us.

5.—The most attractive bait discovered is animal fat. Bacon fat was superior to beef suet. The semi-solid gelatin settling out from roast beef drippings was of no interest at all and was neglected after the first taste. Taste buds in the tip of the bill appear to be highly sensitive and discriminative. The turpentine-linseed flux of paints used in marking is very repugnant and seemed to be recognizable by odor before actual contact was made. I was repeatedly impressed by their seeming acuity of olfactory perception.

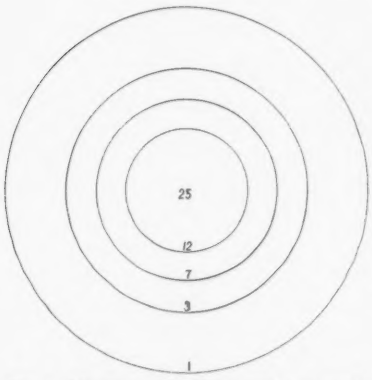

Fig. 6. Diagram representing results of marking of albatrosses; 25 birds were marked; 12 repeated at 20 miles, 7 at 30, 3 at 40, and 1 at 50 and 60 miles.

6.—Albatrosses engaged in subsurface feeding in either of two ways. One way was by the tip-up method of surface-feeding ducks, the wings remaining closely folded. The other method was by a complete submergence with wings fairly well extended and seemingly used in swimming down to a distance of two or more feet. A turn was then made and the bird again broke surface head first. Photographs of both types of subsurface feeding were obtained.

7.—It is more than probable that the use of an attractive bait in chumming at consecutive stations induced birds to wander farther than normal from the point of first marking. Individual birds even appeared to "remember" from one station to another the feeding procedure.

8.—On the ship's return to a general area along a subsequent transect line thirty miles farther south, no marked bird from the previous transect ever appeared.

9.—In undisturbed nature these birds probably have a feeding area with a radius of about fifteen or twenty miles. It is conceded, however, that with the drift of water masses the area of an individual bird may drift also.

University of California, Los Angeles, September 1, 1941.

THE NUMBER OF EGGS LAID BY COWBIRDS

By DAVID E. DAVIS

The number of eggs laid by an individual cowbird is difficult to ascertain in those species which deposit their eggs parasitically in the nests of other birds. It is practically impossible to follow an individual cowbird closely enough to find every egg laid in a season. Nevertheless, by utilizing several techniques, we have accumulated sufficient information to reach a tentative conclusion concerning the number of eggs laid by one individual.

In order to outline the background of the subject it seems desirable to review the literature in some detail. Friedmann's book (1929), from which the following is compiled, is a storehouse of information derived from extensive field work. The cowbird group contains several species distributed in the western hemisphere, and demonstrates the evolution of parasitism. *Agelaioides badius*, an Argentine species, is the most primitive and incubates its own eggs. However, it does not build its own nest but remakes old nests of other species to raise its young. According to Friedmann individual birds lay five eggs and are single brooded; the height of the breeding season is January or February. The next species in this evolutionary series is *Molothrus rufo-axillaris* which parasitizes only *A. badius*. It probably lays five eggs at daily intervals. A third species, *Molothrus bonariensis*, parasitizes many species of birds and occurs throughout South America. According to Friedmann the birds lay daily and several may use one nest. Hudson (cited by Friedmann) believed that each female laid between 60 and 100 eggs in a season, but Friedmann suggests that 6 to 10 is a more likely number.

Our North American Cowbird, *Molothrus ater*, is the best known species. The birds lay daily and Friedmann (p. 182) reported that two birds laid five eggs each and one bird laid four eggs. He is convinced that these individuals did not lay more eggs in that season. He sectioned the discharged follicles of the ovary of several females and found no more than five empty follicles present in any one ovary. Apparently he did not make serial sections of the entire ovary. Although this evidence suggests that only five eggs are laid in a season, there is, in contrast, a record, quoted by Friedmann, of a captive cowbird which laid 13 eggs in 14 days. It is suggested that the cowbirds are possibly in transition between the determinate and indeterminate types of oviposition. In the former type a definite number of eggs is laid whereas in the latter the number laid depends on various external conditions.

In addition to Friedmann's work, Nice (1937:164), while studying the Song Sparrow, obtained much information about cowbirds. Her data are not conclusive but do suggest her belief that cowbirds lay 3 or 4 sets with intervals of 6 to 12 days between sets. However, if we assume that each female lays only five eggs in each set and lays at daily intervals, Nice's table must be rearranged, leading to the conclusion that the interval between clutches is as short as three days.

Information concerning the number of eggs laid by an individual may be obtained by sectioning the entire ovary. The following data were obtained from the study of serial sections cut at 10 or 20 μ and stained in Mallory's triple stain. Before discussing the number of eggs it is necessary to mention the condition of the ovary. After ovulation the post-ovulatory follicle regresses through a series of histological changes as described by Davis (1942*a*). A study of the microscopic structure of the follicle permits a determination of the age of the follicle up to about five days. The histological changes are less distinct in older follicles and therefore the age in days can no longer be determined. However, the relative age can be stated. In studying the ovary one must be

careful not to confuse the burst atretic follicles (Davis, 1942*b*) with the postovulatory follicles.

The table gives the number (indicated by the total number of stage symbols) and stages (I-XIII) of the follicles for 11 individuals of *M. bonariensis*, and one each of *M. rufo-axillaris* and *A. badius*. Several more ovaries were sectioned but contained only unripe follicles or completely regressed postovulatory follicles. It should be remembered, as mentioned above, that the first 6 numbers refer to daily stages while the higher numbers merely denote histological stages of regression. The period of time between stage VI and VII is not known but is probably more than one day. Number I refers to eggs which burst out of the ovary at the time the bird was shot; these eggs were probably ready for ovulation.

Number and stage of postovulatory follicles present

No.														Date	Location of Egg
Molothrus bonariensis															
A6		IIC	IIIC	IVC V				VIII	IX	X				Nov. 5	
A11	I	IIC	IIIC	IVC					IX					14	
A12		IIB	IIIB											14	shell gland
A13		IIA	IIIA	IVA VA	VIA				IX	X				15	oviduct
A16	I	IIB					VII	VIII					XIII	17	shell gland
A21		IIA	IIIA	IVA VA			VII	VIII	IX					29	oviduct
A26									IX					Dec. 7	
A33		IIA	IIIA	IVA										10	oviduct
A38		IIA						VII			XI			14	oviduct
A39		IIB									XI	XII	XIII	14	shell gland
A52		IIC	IIIC				VII	VIII						15	
Molothrus rufo-axillaris															
A42		II	III	IV					IX	X	XI			14	
Agelaioides badius															
A53		II	III	IV V	VI								XIII	17	albumen gland

Some general remarks concerning certain individuals are desirable. It is to be noted that in no case is there a continuous series of more than five eggs. A13 had just completed its second clutch, while A6 and A21 had one more egg to lay. A12 apparently is just starting its first clutch. In A21 there apparently was a short time between the two clutches; the interval is certainly two days and probably three. A39 apparently had a long interval between the two clutches. It should be noted that *M. rufo-axillaris* and *A. badius* lay more than one clutch, contrary to the information formerly available.

It will be noted that in the older clutches there are less postovulatory follicles than would be expected, since four or five eggs is the normal number per clutch. No explanation appears completely satisfactory. Several possibilities occur: (1) the first clutch may have fewer eggs than later clutches; (2) the laying may have been interrupted by environmental factors; (3) part of the ovary might have sloughed off, as has been recorded (Hutt, 1939; Parker and Kempster, 1940), thereby carrying some postovulatory follicles with it; perhaps this phenomenon is more common than suspected.

Summary and Conclusions.—A review of the literature concerning oviposition in cowbirds showed that due to the inherent difficulties of studying a parasitic bird the available information was inconclusive. However, certain data did suggest that four species of cowbirds (*Agelaioides badius, Molothrus rufo-axillaris, M. bonariensis,* and *M. ater*) lay eggs in clutches of four or five.

A histological study of serial sections of the entire ovary of 11 specimens of *M. bonariensis* and one each of *M. rufo-axillaris* and *A. badius* shows that these species lay eggs in clutches and that the maximum number of eggs per clutch is five.

This investigation was aided by a grant from the Dr. Wallace C. and Clara A. Abbott Memorial Fund of the University of Chicago.

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Whitman Laboratory for Experimental Zoology, University of Chicago, Chicago, Illinois, October 23, 1941.

THE FISHING ACTIVITIES OF DOUBLE-CRESTED CORMORANTS ON SAN FRANCISCO BAY

By GEORGE A. BARTHOLOMEW, JR.

Since cormorants are an abundant, wide-ranging group of birds of conspicuous size and habits, much has been written of their behavior. Comprehensive papers, notably those by Lewis (Natural History of the Double-crested Cormorant, 1929, 94 pp.) on *Phalacrocorax auritus* in Canada and by Portielje (Ardea, 17, 1927:107-123) on *Phalacrocorax carbo* in Europe have treated the subject in detail. Most of the work on cormorants, however, has been concerned with their breeding behavior, and, with the exception of studies of food habits, there has been no adequate work on their non-breeding activities.

In the course of a study of the daily movements and distribution of cormorants in the east-central part of San Francisco Bay, California, during 1940 and 1941, frequent opportunity for the observation of the fishing activities of the Double-crested Cormorant (*Phalacrocorax auritus*) was afforded.

All the Double-crested Cormorants on the central part of San Francisco Bay roost at nighttime on a power line running from Brooks Island to the east shore of the Bay, a distance of slightly more than one and nine-tenths miles. Each morning when the birds leave the power line, virtually all fly in the same direction. Consequently on any one morning the flocks of departing cormorants pass over the same part of the Bay and large groups of them often congregate on the water and fish en masse.

From September through November, 1940, the cormorants which roosted on the Brooks Island power line were fishing in the area between the approach to the San Francisco-Oakland Bay Bridge and the Berkeley Pier. This area is enclosed on three sides by roads and accordingly offers excellent facilities for the observation of aquatic birds.

The activities of a large fishing flock, although subject to frequent variations, always follow the same basic pattern. The formation of such a flock, like all movements involving large numbers of cormorants, is gradual. Apparently there is no "prearranged" place for its formation. When the birds prepare to alight they all come down as a group without preliminary circling. The first group to alight as a rule does not begin fishing at once, but swims slowly about, with birds diving only occasionally. After the first cormorants have landed on the water, other flocks alight with them and the size of the raft of swimming birds increases rapidly. Usually only one large flock is formed in any one area, but on October 6, 1940, two fishing flocks, one of about 400 and the other of about 500 individuals, formed a mile and a quarter apart. Late arrivals joined whichever flock was the closest as they crossed the Berkeley Pier.

Cormorants which arrive after a fishing flock has begun to form probably locate it by sight. It may be that the presence of fishing cormorants is indicated to approaching flocks by the swarm of gulls flying about above them, for I have often discovered their presence in this manner. Flocks of cormorants flying away from the power line frequently alter the direction of their flight by as much as ninety degrees as soon as they have crossed the Berkeley Pier and are able to see the spot where the fishing flock is forming.

At 8:10 a.m. on October 5, 1940, a flock of approximately 450 birds had formed on the water one-half mile south of the Berkeley Pier and a quarter of a mile off shore. A flock of sixty cormorants shortly after crossing the Berkeley Pier a mile and a half from shore apparently sighted this fishing flock, for they turned abruptly and flew east

to join it. This turn of almost eighty degrees was initiated not by the birds at the apex of the flock, but by those birds which were in the part of the "V" nearest the fishing cormorants. Consequently the turn began at the east end of the formation and spread steadily westward though the rest of the flock.

The mere presence on the water of a small group of birds even of another species will sometimes attract a flock of cormorants that is flying over the area. At 7:36 a.m. on October 7, 1940, a flock of cormorants crossed the Berkeley Pier flying about forty feet in the air. After dropping down near the water, they turned sharply to the left and headed toward a loose flock of birds resting on the water approximately three-eighths of a mile to the southeast. When they reached this flock, instead of alighting they turned to the right and flew on southward. I looked through my telescope at the birds which the cormorants had approached and discovered that they were immature gulls.

Active fishing usually begins before the fishing flock is fully formed, but birds which arrive after the fishing has begun join the flock without disturbing its formation or activity. The actual method of fishing is always the same. The size of fishing flocks is highly variable. Concerted fishing activities seldom develop in groups containing fewer than ten or twelve birds, but flocks seen on the Bay range from this minimum figure up to a maximum of approximately 1900. Except for occasional groups fishing near the Brooks Island power line in the late afternoon, flocks larger than one hundred always form early in the morning before the birds have had a chance to scatter widely.

The formation assumed by a large flock is a long, narrow, but closely packed, line which may be curved or indented at various points but is generally at right angles to the direction of movement of the flock as a whole (see fig. 7). The exact dimensions of the flock depend on the number of birds involved, but the relative proportions are constant and independent of the size of the flock. All the birds swim in the same direction and nine-tenths of them are in the narrow line. In a flock of fifty or sixty birds, this leading line rarely contains more than a single rank of cormorants, but in a flock of 500 or more it may be three or four birds deep. The few birds that are not in this line are scattered loosely behind the main part of the flock. Active fishing is confined almost entirely to the front line.

The movement of the flock as a whole is divisible into several components (see fig. 7). All the cormorants swim along the surface in one direction. When they dive, they are of course headed in this same direction and they continue to swim straight forward while they are beneath the water. The birds beneath the water and those on the surface move at about the same speed so that when a cormorant appears at the surface after a dive, it is either close to or actually in the line of birds swimming there. Perhaps one bird in seven, however, returns to the surface behind the main group. These laggards do not attempt to overtake the others by swimming; instead they take off and fly over the flock and land in front of the main line and allow it to overtake them. This flying from the rear to the front imparts to the flock a constant rolling movement which materially increases its speed. Flying is rarely seen in flocks smaller than twenty-five and it becomes more and more conspicuous as the size of the flocks increases.

A group of cormorants that is fishing appears to be considerably smaller than it really is because one-quarter to one-half of the birds are usually beneath the water. The direction of movement often changes. In groups of fifty or less, turns of 90 or even 180 degrees are not infrequent, because such relatively small flocks are readily and quickly reorganized. A group larger than 500 usually pursues a relatively straight course and when it does turn, since it may be 80 or 100 yards long, considerable time and much flying about are required before it can reorganize itself and head off in the new direction.

When a large flock turns sharply, it is apparently because of an alteration in the direction of movement of the school of fish which it has been pursuing, for such a turn is almost always preceded by a cessation of fishing. After drifting aimlessly for from a few seconds to two or three minutes, the birds at one end or the other of the flock will resume their diving. Soon other near-by birds join in and almost immediately a short new fishing line forms and begins to move off. At first this newly formed fishing group contains only those birds which were near the spot where the fishing was resumed, but as soon as the new line is definitely established, birds in distant parts of the flock take off and fly over to join it. This movement is not en masse; first one individual and then another takes off, and in flocks larger than 1000, a continuous, but straggling, stream of birds passing from the non-fishing to the fishing flock will be formed. So gradual is

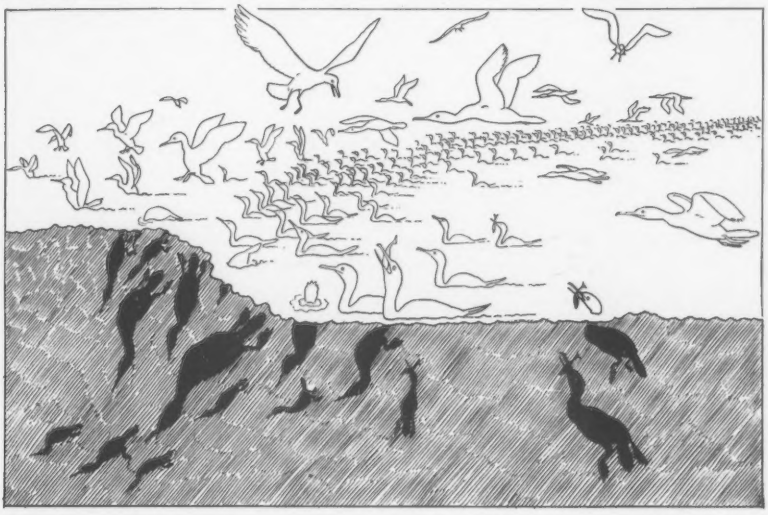

Fig. 7. Drawing showing arrangement and activity of a large fishing flock of Double-crested Cormorants.

this flight that the stream of flying birds may persist for five or six minutes. While the shift is going on, the fishing birds move rapidly away and the amount of flying necessary to overtake them increases continually.

Occasionally when an extremely large flock which has been fishing for a long time changes direction, it splits and one part swims away and continues to fish while the other part remains behind resting quietly on the water. After the fishing birds have moved a quarter of a mile or so away, members of the resting group sometimes fly over and join them. This too is a gradual movement, carried out by individuals or at most groups of three or four. When it is well under way, a continuous, but irregular line of flying birds all moving in the same direction connects the two flocks. Such a flight often lasts for ten or fifteen minutes.

The birds in a fishing flock are more active than those which fish by themselves. When fishing is good, a cormorant flock presents a scene of almost frenzied activity and the screaming gulls hovering in the air overhead heighten the impression of unlimited energy. The only noise made by the cormorants themselves is a continuous splashing,

swishing sound caused by their movement through the water and through the air. On calm days, this sound is audible when the birds are 200 yards away. The large number of birds swimming, taking off and alighting roils the water and creates a conspicuous disturbed area around the flock. When fishing in a large flock, it is not unusual for cormorants to leap completely out of the water as they dive, but this almost never occurs in small flocks. Birds of a flock often send vertical splashes two to three feet into the air as they dive, whereas solitary birds make such a slight disturbance that they seem to slide beneath the water.

All cormorants in a fishing flock swim continuously and rapidly at a uniform speed. There is no pause in their forward motion even while they are shifting a fish about in their bills or swallowing.

When a lone cormorant is fishing, it appears to search beneath the water for individual fish, but large fishing flocks undoubtedly pursue whole schools of fish. The reasons for this assumption are several. The large number of fish caught could only be captured if the birds had access to a school. The changes in direction of the flocks can best be explained as maneuvers to allow them to follow the flight of a school. The entire flock of cormorants will take off and fly to some other part of the Bay when fishing is poor. The activity of a large fishing flock, which is much more intense than that of a small one, suggests that the birds are stimulated to their maximum intensity of effort by the presence of large numbers of easily caught fish. If a large flock of cormorants were driving a school of fish before it, there would be no need for the birds to zigzag back and forth searching for a fish; they could merely dive beneath the water and swim straight ahead until they sighted a fish, seize it and return to the surface. Thus the fact that the birds reappear at the surface headed in the same direction as when they dived, together with the fact that birds swimming under water do not lag behind those on the surface, bears out the premise that members of large fishing flocks do not search for scattered individual fish.

There are several reasons why the formation here described should be assumed by large flocks of fishing cormorants. When the birds form a long thin line stretching at right angles to the direction of the movement of the flock as a whole, the extended front serves to drive the school of fish before it, while the length of the line tends to keep the fish from escaping off to the side. The fish undoubtedly flee from the flock and if the birds were in a dense compact formation, only those individuals on the leading edge of the flock would have much chance of catching anything, whereas when the cormorants swim side by side, all are fishing in water from which the fish have not yet been chased.

Mass fishing is an efficient way of obtaining food and a surprising number of cormorants return to the surface with fish in their bills. Because of the great activity and the many birds, it is almost impossible to estimate the average number of dives necessary to catch one fish in mass fishing. Purely as a guess, but a guess based on many hours of observation, I would suggest that one in every six or seven birds returning to the surface has a fish. The fish (possibly anchovies) caught in mass fishing seldom exceed five inches in length and many are required to furnish an adequate meal.

The dissolution of a large fishing flock is caused by one of two factors: escape of the school of fish, or satisfaction of the hunger of the cormorants. The behavior of the birds in the two cases is distinctly different. When the cessation of fishing is the result of the escape of the school of fish, diving stops abruptly; the flock loses its formation and the birds drift about slowly and aimlessly or dive haphazardly. If any of the birds find the lost fish again or discover another school, fishing is resumed and the flock assumes the usual formation. If no fish are found in the vicinity, the flock flies away. The birds do

not take to the wing all together, but rather gradually, so that a straggling line is formed. If the birds fly more than a half-mile, the continuous line breaks up into flocks which adopt asymmetrical "V" or single-line formations. The birds all fly in the same direction and alight on the water in a compact raft to form another fishing flock. Sometimes a flock that has lost its school of fish will take off and alight on three or four different parts of the Bay before beginning to fish again.

When the cessation of fishing is the result of satiation, the fishing of the birds stops slowly rather than abruptly. This type of break-up of a flock can be described by quoting from my field notes concerning a group of cormorants observed south of the Berkeley Pier on the morning of October 7, 1940: "9:45.—The fishing flock is beginning to break up. Some of the birds in the rear of the flock instead of alighting in front of the other birds after taking off are leaving the flock and flying away in the direction of the Brooks Island power line. 10:00.—Many of the cormorants are lagging behind to form a wake of scattered birds flapping their wings, drying their feathers or resting quietly on the water behind the actively fishing birds. When these scattered laggers are resting quietly on the water, they are relatively inconspicuous, but when they flap their wings to shake the water off, they blossom forth like small black explosions. 10:05.—The fishing flock continues to decrease in size, more and more birds are dropping behind and an increased number of small flocks are taking to the wing and flying away northward. 10:12.—Fishing has stopped completely. Instead of a compact raft of birds, there is now a loose flock scattered over an area half a mile square. 10:20.—Whereas forty-five minutes ago there was an organized group of 1500 to 2000 cormorants, now only 200 birds are in sight and these are scattered so widely that they must be considered as solitary individuals rather than as a flock."

Small flocks of fishing cormorants are more common than large ones and the flocks most frequently seen on the Bay contain fewer than twenty birds. These small flocks form at any time of day, usually in the vicinity of the daytime roosting sites. The organization of these small flocks is much more flexible than that of the larger ones. As a rule the birds form a fairly compact group, perhaps one bird to each square yard of water surface, but instead of making a long narrow line at right angles to their direction of movement, they tend to assume a roughly circular formation. All of the birds in the flock face in the same direction as they swim steadily along. Birds in the trailing edge of the flock dive just like those on the leading edge. It is noticeable that in small flocks there is no flying. Those birds that lag behind or come to the surface some distance to the rear of the flock do not take to the air to catch up with the others; they simply swim faster. The speed of movement of small flocks is about one-third less than that of large ones. The reduced speed is due to two things, the slower swimming and the absence of flying. The slower swimming allows the birds that lag behind to overtake the main group by swimming and this of course does away with the necessity for flying. Small flocks as a rule apparently do not pursue schools of fish. The birds do not always swim along beneath the water parallel to the direction of the main part of the flock, for individuals often come to the surface headed 90 or even 180 degrees away from the line of movement followed by the rest of the birds. These individuals, however, immediately turn and swim after the others. All the members of a small fishing flock dive in the direction of movement of the group as a whole, and in order to be facing some other way when they reappear at the surface, they must reverse directions while under the water looking for or pursuing fish. The small flocks change direction more readily and frequently than large ones. Even when an entire flock completely reverses direction, none of the birds takes to the wing.

There is no synchronization of diving in either large or small flocks. As a result, the number of cormorants visible at one time is highly variable. In a flock that was fishing about 150 yards off shore in the bay opposite the Berkeley Aquatic Park, the number of birds on the surface at any one time varied all the way from three to twenty. The only time that it is possible to determine accurately the size of a fishing group is when it reverses direction, for then most of the cormorants stop diving for a few seconds.

The cessation of fishing in small flocks differs from that in large flocks in that it follows a constant pattern, probably because the break-up almost invariably occurs in the immediate neighborhood of one of the roosts on which the cormorants spend their days. Small fishing flocks break up gradually. First one bird and then another, having caught all the fish it wants, will take off, fly back to the roosting site, alight and begin to preen and dry its feathers. The movement back to the roost continues until the flock has disappeared. Often one or two birds, probably because of poor fishing, continue to dive long after the others have returned to the roost. As a rule relatively fewer fish are caught by the members of the small flocks than by the members of the larger groups. This is probably because the former have to hunt for their prey while the latter need merely to swim into a school and seize a fish.

The small number of fish caught by the small flocks of cormorants may explain why they are so seldom accompanied by flocks of gulls. The gulls cannot obtain enough fish to make it worth their effort.

Cormorants do not always fish in flocks. It is a common sight to see solitary individuals or groups of two or three fishing by themselves. There is not even a hint of organization in a group of less than four or five cormorants.

The fish caught by cormorants on San Francisco Bay are seldom more than five or six inches long. When a cormorant returns to the surface after a successful dive, its prey is usually held crossways in its bill. At first it apparently is held in the same position in which it was caught, for sometimes it is grasped near the head and other times near the tail, but before being swallowed it is shifted so that it will go down head first. Lewis (*op. cit.*: 72) says that small soft fish are swallowed in any position, but I have never seen fish swallowed other than head foremost. A cormorant shifts a fish to a position suitable for swallowing by shaking its head from side to side and executing chewing movements with its mandibles. Since I have been able to watch large flocks of fishing cormorants, there has been opportunity to see literally thousands of fish caught, and only once have I seen a fish tossed into the air before being swallowed. On this occasion, the fish could very easily have flipped itself into the air by a sudden flirt of its tail. Once caught, fish are seldom lost, but the large number of gulls which habitually accompany flocks of fishing cormorants testifies to the fact that some fish escape.

As Lewis points out, cormorants swallow in a series of jerks in which the head is thrust forward and slightly upward. Smaller fish are swallowed with one forward movement of the head, but with larger fish, four or five thrusts may be necessary. Swallowing distends the neck and gular pouch. If the fish is a large one, the lashing back and forth of its tail as it passes down the neck of its captor is clearly visible. After swallowing, a cormorant invariably shakes its head vigorously from side to side.

When a small fish is caught, the other cormorants in the flock pay no attention, but when a large fish that is difficult to swallow is captured, two or three near-by birds occasionally give chase and attempt to rob the captor. A bird which captures an unusually large fish appears to realize that others will attempt to rob it, for instead of swimming along with the flock as it normally would, it turns and moves directly away from the other birds. On November 11, 1940, at 7:30 a.m., a flock of twenty-five cor-

morants was fishing in the bay just west of the Berkeley Yacht Harbor. Twice within three minutes exceptionally large fish were caught and both times similar but unsuccessful attempts at robbery were made. A cormorant came to the surface with a flounder about eight inches long. Due apparently to the excessive width of the fish, the bird had difficulty in swallowing it. Instead of swimming along the surface in the customary manner, the cormorant turned, stretched out its neck, and using both wings and feet simultaneously, fled in the opposite direction, half swimming and half hopping along the surface of the water. As soon as it started to flee, two near-by birds turned and gave chase. In spite of the efforts of its assailants the bird finally managed to swallow the fish, and the would-be robbers returned to the flock and resumed their fishing. The fish made a conspicuous bulge in the neck of its swallower. Fully fifteen seconds elapsed before the fish reached the base of the neck where it formed a lump so large that it looked as if the bird had a broken neck. After swallowing, the bird swung its head strongly from side to side, stuck its head beneath the water, shook it, and then swam away shuffling its wings back and forth and splashing water over its back. After this, it reared back and flapped its wings for six or eight seconds as if trying to adjust the position of the fish. It did not again rejoin the flock but remained floating quietly on the water.

The cormorant normally is not a scavenger, but on occasion it will resort to this means of obtaining food. Lewis (p. 71) quotes Frank L. Farley as saying that at Miquelon Lakes, Alberta, he has seen adult Double-crested Cormorants picking up pieces of fish lying near the nests of White Pelicans (*Pelecanus erythrorhynchos*). Although this species of cormorant has never been seen scavenging on San Francisco Bay, on April 13, 1941, Dr. S. B. Benson saw four or five Brandt Cormorants (*Phalacrocorax penicillatus*) eating bait that was being discarded by a fisherman in a rowboat in the Richmond Channel. On April 20, Dr. Benson and I attempted to attract cormorants in a similar manner in the same place. Although there were six or eight Brandt Cormorants roosting on the breakwater within fifty yards of us, only Western Gulls (*Larus occidentalis*) and Brown Pelicans (*Pelecanus occidentalis*) were attracted by the bait. In the morning we saw a commercial fishing boat moving slowly out the channel. Behind it was a dense flock of birds containing about 150 gulls, ten Brown Pelicans and a group of about eight Brandt Cormorants. The cormorants remained together and did not approach as close to the boat as the other birds, but like the others they were presumably feeding on fish or scraps which the fishermen were discarding.

Because of the large concentrations of aquatic birds on San Francisco Bay during the fall, winter, and spring, other species of birds often associate with cormorants while they are fishing. The most persistent and conspicuous association is that between Farallon Cormorants and gulls. The largest number of gulls that I have seen with any single flock of cormorants is about 250. When relatively small groups of cormorants are fishing near a favorite roosting place of the gulls, the latter may outnumber the former two to one. Gulls which have been seen with flocks of cormorants on the bay include Western (*Larus occidentalis*), Glaucous-winged (*Larus glaucescens*), Bonaparte (*Larus philadelphia*), California (*Larus californicus*), and Ring-billed (*Larus delawarensis*). Western and Glaucous-winged gulls are the ones most commonly associated with the cormorants. The gulls fly about above the fishing cormorants calling noisily and occasionally dropping to the water to pick up a fish. Frequently, they alight on the water in the midst of the cormorants who ignore them completely. The gulls cannot swim fast enough to keep up with the cormorants and a few seconds after alighting they drop behind and then take to the wing again. As soon as the fishing stops, the gulls scatter,

but if the flock of cormorants should fly away, the gulls do not follow them. Gulls do not ordinarily accompany individual cormorants or groups of less than twenty-five. Only once have I seen a gull attempt to rob a cormorant other than those with a fish too large to swallow readily, and this attempt was unsuccessful.

I am indebted to Mr. Herman V. Leffler, of Oakland, California, for the account of an interesting relationship between gulls and cormorants. On February 8, 1941, while watching birds in the Berkeley Aquatic Park, Mr. Leffler saw about ten Double-crested Cormorants, with a number of Bonaparte Gulls flying about above them, fishing in the water flowing into the lagoon from the bay through a culvert which runs underneath the Bayshore Highway. The cormorants were catching perch (size unspecified), some of which were pregnant. As the cormorants shifted the fish about preparatory to swallowing them, either the shock of being caught or the pressure of the birds' bills caused the perch to give birth to young which were spewed forth into the water. The gulls then dropped down and picked up the new born fish, but the cormorants made no attempt to eat the baby perch.

In the spring and fall when Forster Terns (*Sterna forsteri*) are abundant on the Bay, they frequently dive into the water in front of small groups of fishing cormorants. Even though a tern may strike the water within thirty inches of a cormorant, the splash evokes no response. Brown Pelicans also often dive in the vicinity of fishing cormorants without disturbing them. On one occasion three pelicans which were flying over a flock of about twenty cormorants dived into the water simultaneously. One hit the water about a yard in front of the flock and the other two came down about the same distance behind the flock, but the big splashes seemed to have no effect on the activities of the cormorants who continued their fishing as though nothing had happened.

When cormorants are fishing, they usually ignore any and all species of birds which may be in the vicinity. On various occasions I have seen Pacific Loons (*Gavia arctica*), Red-throated Loons (*Gavia stellata*), Pied-billed Grebes (*Podilymbus podiceps*), Western Grebes (*Aechmophorus occidentalis*), Eared Grebes (*Colymbus nigricollis*), American Egrets (*Casmerodius albus*), American Mergansers (*Mergus merganser*), and Red-breasted Mergansers (*Mergus serrator*), all of which are fish eaters, fishing within less than a yard of Double-crested Cormorants without either species paying any attention to the other.

During the winter immense flocks of ducks congregate on San Francisco Bay and in the early morning it is not unusual to see a flock of several thousand Ruddy Ducks (*Erismatura jamaicensis*), or an equally large mixed flock of White-winged Scoters (*Melanitta deglandi*) and Surf Scoters (*Melanitta perspicillata*) resting on the water in a loose raft. I have never seen any large flocks of cormorants come in contact with one of these rafts of ducks, but flocks of fifteen or twenty frequently do. They move along as if there were not a duck within miles. The ducks, however, swim leisurely aside as the cormorants approach and leave a temporary lane of open water for them to swim through. In this manner a small flock of fishing cormorants may pass completely through a flock of ducks.

Only once in the scores of times that I have seen ducks and cormorants swimming within a foot or less of each other has there been any antagonism. A dozen Surf Scoters and three Double-crested Cormorants were swimming about among some old pilings in the east end of the Berkeley Yacht Harbor. An immature cormorant and a female scoter approached each other swimming in opposite directions and passed less than eight inches apart. For no apparent reason, when the two were side by side, the cormorant opened its bill and thrust out vigorously at the duck which scurried away for about a yard. The cormorant made no attempt to follow it.

Wetmore (Condor, 19, 1927:273-274) states that individuals of *Phalacrocorax auritus floridanus* confined to a cage 158×50×56 feet in the National Zoological Park in Washington, D.C., remained in excellent health when fed three-quarters of a pound to one pound of fish daily, six days a week. Since the cormorants on San Francisco Bay probably do more flying and swimming than the caged specimens mentioned by Wetmore, their consumption of fish must be about one pound per day per bird. Since during most of the fall and winter of 1940-41 the number of cormorants in the central part of San Francisco Bay was about 2000, they caught and ate approximately one ton of fish daily. Nevertheless, it seems improbable that these birds have any economic importance, for little commercial fishing is done on the Bay. Cormorants do not compete with sport fishermen because the only important game fish on the Bay is the introduced striped bass, and this fish is usually too large for the birds to handle.

No effort was made to determine by an examination of stomach contents the kinds of fish eaten, but cormorants on San Francisco Bay have been seen catching smelt, flounder, and pipe fish, and they probably will eat any fish of a reasonable size that they can catch.

Acknowledgements.—I am indebted to Dr. Alden H. Miller for advice and criticism in the writing of this paper and to George A. Bartholomew, Sr., for the preparation of the illustration.

SUMMARY

All the Double-crested Cormorants on the central part of San Francisco Bay, California, roost at night on a power line running from Brooks Island to the east shore of the Bay. In departing from the power line in the morning, all fly in one direction and they often congregate on the water in rafts containing as many as 1800 or 2000 birds to engage in mass fishing activities. In flocks containing more than forty or fifty birds, the cormorants form a long narrow line at right angles to their direction of movement. The forward movement of the flock is divisible into three components, swimming on the surface, swimming beneath the water, and flying from the front to the rear of the flock.

Large fishing flocks of cormorants pursue entire schools of fish; small flocks hunt for individual fish.

The break-up of a large flock of cormorants results either from the escape of the school of fish or the satisfaction of the hunger of the birds. In the former case, fishing stops abruptly; in the latter, it stops gradually.

Large flocks (500 or more) form only in the morning before the birds have had a chance to scatter widely over the Bay. Small flocks (50 or less) are more commonly seen than large ones and they form at any hour of the day, usually in the vicinity of the various roosts on which the birds spend their time when they are away from the nighttime roost. Small flocks form compact, roughly circular groups in which all the birds move through the water in the same direction. The movement of small flocks is dependent solely on swimming, for their members never take to the wing during the fishing activities.

The break-up of small flocks is always gradual. Each bird stops fishing when its hunger is satisfied.

Flocks of as many as 250 gulls may accompany large groups of fishing cormorants, but they rarely follow small fishing flocks. Fishing cormorants ignore other species of birds with which they may be associated.

Because of the small amount of commercial fishing done on San Francisco Bay, cormorants can hardly be of any economic importance there.

Museum of Vertebrate Zoology, Berkeley, California, September 15, 1941.

FOUR NEW WOODPECKERS FROM THE WESTERN UNITED STATES AND MEXICO

By A. J. VAN ROSSEM

The present definitions of unnamed races of woodpeckers in the genera *Centurus* and *Dryobates* are the result of no sudden "discovery." They have been under consideration for a number of years and are the result of accumulated data. They have not been published previously chiefly because material from certain critical areas was not available in sufficient quantity to insure the proper application of names. I feel certain that these cases would long ago have been similarly disposed of by any one of several systematists had it been possible for them to examine adequate series. Diagnoses of these races follow.

Centurus uropygialis albescens new subspecies
Colorado River Gila Woodpecker

Type.—Adult male, no. 14746 Dickey Collection; Laguna Dam, lower Colorado River, Imperial County, California, December 31, 1924; collected by A. J. van Rossem.

Subspecific characters.—Palest of the races of *Centurus uropygialis*. Barring on the dorsum with white bars equal to or wider (often decidedly wider) than the black; rump and upper tail coverts with barring or spotting at a minimum for the species; head, neck, and underparts, as compared with *uropygialis*, paler and more grayish (less brownish) drab, yellow abdominal patch paler yellow, and crown patch in males more orange (less scarlet) red. Size slightly smaller than *uropygialis*.

Range.—The riparian associations (chiefly cottonwood, willow, and mesquite) of a narrow strip along the lower Colorado River from extreme southern Nevada, Fort Mojave, Arizona, and Needles, California, south to extreme northwestern Sonora and extreme northeastern Lower California. Presumably this race occurs in farming country in the Imperial Valley (Calipatria; El Centro; Brawley).

As a result of the examination of much additional material, chiefly from Arizona and northwestern Sonora, I have been obliged to alter my once expressed opinion (Bull. Mus. Comp. Zool., 77, 1934: 409-411) as to the inadvisability of recognizing more than one northern race of the Gila Woodpecker. The type locality of *uropygialis* is at, or near, the juncture of the Santa Maria and Bill Williams Rivers in southwestern Arizona, a locality so close to the Colorado River that one might assume the racial identity of Gila Woodpeckers from these two localities. In the collection of the United States National Museum is a specimen (12324) taken at "Camp 121" [=juncture of Santa Maria and Bill Williams rivers] by Kennerly and Möllhausen on February 13, 1854, which is generally regarded as the type of *Centurus uropygialis* Baird. On the reverse of the red type tag is pencilled (by Dr. Richmond?) the following: "This is a co-type, and possibly *the* type, but there should be *another skin* from the same locality." On the original field tag there is also written in pencil "one of the types!" In every respect (the tip of the bill is missing) this specimen is typical of the darker, slightly larger race which occurs in quite stable form over southern Arizona in general, and in northern Sonora and southwestern New Mexico. I have not been able to locate any topotypical specimens, but thanks to Mr. W. J. Sheffler specimens from Salome, some thirty miles south of the type locality have been found to be identical. Birds from Gila Bend are likewise *uropygialis*, but nothing from west of that point along the Gila River has been examined.

Centurus uropygialis tiburonensis new subspecies
Tiburón Island Gila Woodpecker

Type.—Adult male, no. 50256 Dickey Collection; Petrel Bay on southeast side of Tiburón Island, Sonora, Mexico, December 29, 1931; collected by A. J. van Rossem.

Subspecific characters.—Nearest in general paleness of coloration to *Centurus uropygialis albe-*

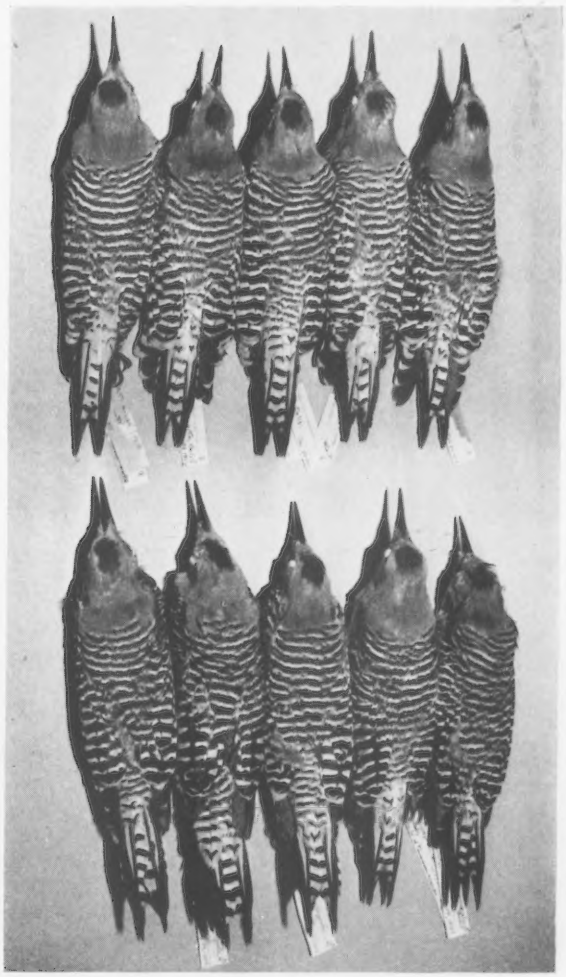

Fig. 8. Upper row, *Centurus uropygialis albescens*; type second from right. Lower row, *Centurus uropygialis uropygialis*.

scens but black and white barring on the dorsum more numerous, narrower, and approximately equal in width. Wing slightly shorter and tail slightly longer.

Range.—Tiburón Island, Sonora.

In two previous publications (Trans. San Diego Soc. Nat. Hist., 6, 1931: 255; *ibid.*, 7, 1932:136) I commented on the paleness of the birds from Tiburón Island and their resemblance to "*uropygialis*" [*albescens*] of the lower Colorado River valley. Thanks to Mr. Laurence Huey, I have been able to examine four specimens from Puerto Libertad which demonstrate that *uropygialis* extends westward to the coast between Tiburón

Island and the Colorado Delta. A series of twelve additional specimens from Kino Bay (also in the Natural History Museum) are also *uropygialis*, although occasional individuals approach *tiburonensis* in color. In view of the isolation of the Tiburón birds, separated as they are from *albescens* by a large territory occupied by *uropygialis*, it seems advisable to give them a name even though the characters are not outstanding.

Dryobates scalaris yumanensis new subspecies
Yuma Ladder-backed Woodpecker

Type.—Adult male, no. 8734 Dickey Collection; Laguna Dam, lower Colorado River, Imperial County, California, January 25, 1913; collected by A. J. van Rossem.

Subspecific characters.—Compared with *Dryobates scalaris cactophilus* Oberholser of southeastern and south-central Arizona, entire coloration paler; forehead (particularly of females) lighter brown; barring on back with white intervals wider (usually much wider) than the black; spotting on wing coverts larger and more conspicuous; auriculars with less of black and more of buff; underparts, including sides of neck, paler buff; spots on flanks and sides of chest fewer in number and more linear (less guttate) in form.

Range.—The Colorado River valley and closely adjacent deserts from extreme southeastern Nevada south in Arizona and California to the Delta region in Lower California and Sonora; east in the valley of the Gila River to about Gila Bend and west in the Imperial Valley of California to the Salton Sea.

When Oberholser revised the Ladder-backed Woodpeckers (Proc. U. S. Nat. Mus., 41, 1911:139-159) he had few specimens from the range of *yumanensis*, for he lists only one locality in California, two in Arizona, three in Lower California, and one in Sonora. All the others cited are from the range of *cactophilus* or of *mojavensis* (see *postea*) as I understand those races at present. This lack of material, combined with the close color resemblance of *cactophilus* and *mojavensis*, is undoubtedly the reason why he did not detect the present race.

Intergradation between *yumanensis* and *cactophilus* seems to be rather restricted northerly. Specimens from the juncture of the Bill Williams and Santa Maria rivers in Arizona, a locality only about thirty miles from the Colorado, are *cactophilus*, as are those from Salome. The single bird from the Charleston Mountains, Nevada, is *yumanensis*, as are two from the Providence Mountains in California. Southerly, *yumanensis* extends east up the Gila River to Gila Bend and is also the race on the Tule Desert. Westwardly, it extends into the Imperial and Coachella valleys, although in the latter locality (Thermal; Mecca; Indio) intergraduation with *mojavensis* is such that some specimens resemble one race, some the other. This species has been personally observed as not uncommon at St. George in the Virgin River valley of southern Utah, but what race is present there I cannot say since no specimens were collected.

Dryobates scalaris mojavensis new subspecies
Mojave Ladder-backed Woodpecker

Type.—Adult male, no. J-23, Dickey Collection; Palmdale, Mojave Desert, Los Angeles County, California, January 6, 1921; collected by A. J. van Rossem.

Subspecific characters.—Most closely similar to *Dryobates scalaris eremicus* Oberholser of northern Lower California, from which it differs chiefly in shorter bill and tail and wider white barring on the back. Differs from *Dryobates scalaris cactophilus* in generally larger size, particularly in bill and wing, and in paler, less buffy, ventral coloration. Differs from the geographically adjacent *Dryobates scalaris yumanensis* in generally larger size, particularly in wing and bill, and in very much darker coloration dorsally.

Range.—A relatively narrow strip along the lower desert slopes (and adjacent deserts) of the Sierra Nevada (south from Lone Pine, Inyo County), San Gabriel, San Bernardino, and San Jacinto mountains, and the mountains of eastern San Diego County and extreme northern Lower California.

This race, as above stated, is a northern form of *eremicus* and bears relatively little resemblance to *yumanensis*, the range of which separates it completely from the range

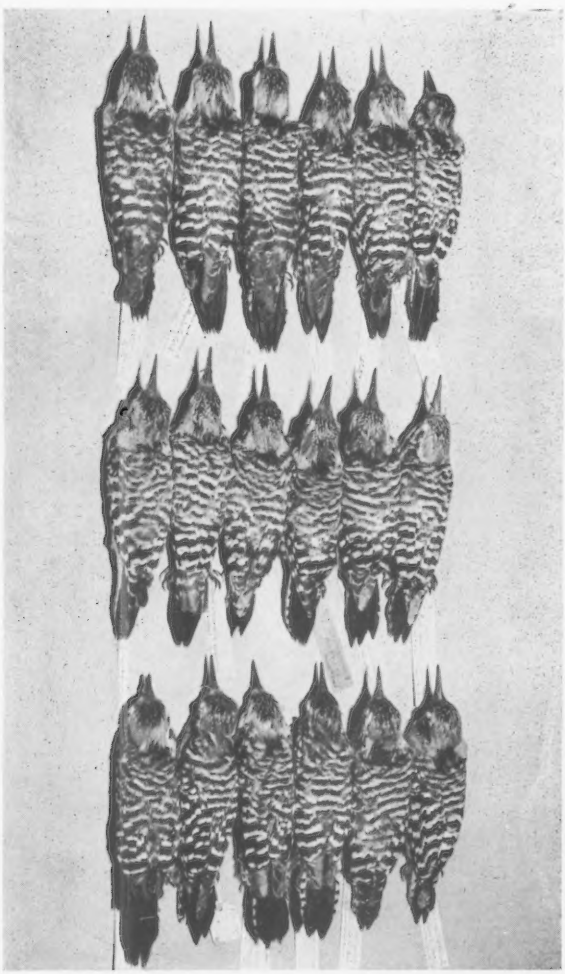

Fig. 9. Upper row, *Dryobates scalaris mojavensis*; type second from left. Middle row, *Dryobates scalaris yumanensis*. Lower row, *Dryobates scalaris cactophilus*.

of *cactophilus*. It occurs at much higher altitudes than *yumanensis*, the average range being in the neighborhood of 3000 feet.

Intergradation with *eremicus* occurs in the vicinity of the east slope of the Sierra Juárez in northern Lower California. I am indebted to Mr. Huey for the loan of nine specimens from this region. These show characters as follows: all possess the long tail of *eremicus*; eight show the bill of *mojavensis*, one the bill of *eremicus*; dorsal colora-

tion is variously intermediate but averages closer, perhaps, to *mojavensis*. Their measurements are not included in the appended table. I have not examined the specimen recorded by Grinnell (Univ. Calif. Publ. Zool., 32, 1928:120) from the northern end of the Nachogüero Valley in extreme northern Lower California as "*cactophilus*" but there can be little doubt that it belongs with the present race. Incidentally, the ranges of the Nuttall and Mojave Ladder-backed woodpeckers probably meet or even slightly overlap more frequently than has been noted. In addition to the meeting in the Nachogüero Valley, I may record the presence of both species in the same tract of woodland in Chino Canyon, on the east slope of the San Jacinto Mountains in late April, 1923.

In addition to the very comprehensive series of all the far-western races of *Centurus uropygialis* and *Dryobates scalaris* in the Dickey Collection, I have examined all, or nearly all, of the specimens in the Bishop, Hancock, Huey, Sheffler, and Willett collections, and in those of the Natural History Museum at San Diego and the Los Angeles Museum.

Measurements.—Measurements of the total length taken in the field are of minor value unless taken by the same collectors. The following are extreme total lengths of males of the four races of *D. scalaris* mentioned in the present paper. They were measured either by Mr. Huey or myself: 4 *eremicus*, 200-215 mm.; 8 *mojavensis*, 190-202; 11 *yumanensis*, 174-190; 4 *cactophilus*, 188-191.

Extreme and average measurements of males in millimeters

	Wing	Tail	Exposed culmen
	Centurus uropygialis		
20 *uropygialis*	131-135 (134.2)	80-86 (83.0)	30.0-33.7 (31.8)
20 *albescens*	126-134 (129.7)	75-84 (79.3)	28.5-31.8 (30.5)
7 *tiburonensis*	122-127 (125.4)	78-84 (82.0)	29.5-32.5 (31.3)
	Dryobates scalaris		
16 *cactophilus*	95-105 (102.0)	60-65 (63.0)	21.5-24.2 (22.7)
30 *yumanensis*	97-106 (101.4)	58-65 (62.5)	22.3-25.1 (23.8)
24 *mojavensis*	102-108 (105.8)	61-70 (64.2)	23.0-27.5 (26.1)
8 *eremicus*	103-108 (106.1)	67-71 (70.0)	27.0-29.0 (28.4)

Dickey Collections, University of California, Los Angeles, September 20, 1941.

NOTES ON SOME PELAGIC BIRDS OF THE COAST OF BRITISH COLUMBIA

By PATRICK W. MARTIN

In the past few years the author has spent the months from early spring until late summer engaged in commercial salmon trolling along the south and central parts of the coast of British Columbia. The areas covered in particular in this work include the west coast of Vancouver Island from Barkley Sound north to Cape Scott and the mainland coast from Queen Charlotte Strait north to Laredo Sound, as shown on the accompanying chart (fig. 10). During the fishing season it was not possible to make regular observations of the birds in the district, because of the necessity of following the migrations or runs of fish which are by no means regular. In consequence, one seldom finds himself in the same area on the same date in consecutive years.

As a result, the large number of ornithological notes that have been accumulated are more or less disconnected. From these I have selected the following in the hope that they will be of interest to the reader and contribute something to the small store of knowledge we have pertaining to pelagic birds in these waters.

Specimens were taken whenever time and weather permitted or whenever specimens were necessary for purposes of definite identification. I only regret that more actual collecting was not possible.

With one or two exceptions all specimens taken are in the collections of the Provincial Museum, Victoria, B.C. The figures following the names of the birds are the museum catalogue numbers.

Diomedea nigripes. Black-footed Albatross. P. M. nos. 8795, 8796, 8797. This species was first observed in 1940 on March 18, off Barkley Sound, Vancouver Island. From that date on, it was constantly observed off Kyuquot until I left that vicinity at the end of May. On the off-shore banks this albatross is a constant companion of the fisherman, at least from April until the end of August. Since most of the off-shore fishing ceases toward the end of August, I have no definite information as to when this bird leaves. However, according to the trollers it is still present off the west coast of Vancouver Island in late September.

Apparently Black-footed Albatrosses procure a considerable portion of their food supply by picking up offal from the fishing boats whenever such an opportunity presents itself. It is a common sight to see several of these birds along with the inevitable train of gulls and shearwaters following a halibut boat, all competing for the choicer morsels that fall from the gutting tables. As might well be expected, these birds appear to prefer the fatter and oilier portions of the offal and I have been told that in former years when the halibut livers were discarded, the albatrosses, or "gooneys," as the fishermen invariably call them, preferred these dainty morsels above all else.

Upon several occasions I have seen albatrosses dive much in the same manner as a shearwater, although they did not stay beneath the surface nearly as long. Inasmuch as we have found squid beaks in the stomachs of several specimens collected, I consider it highly probable that a considerable part of their food is procured in such a manner.

Fulmarus glacialis rodgersii. Fulmar. This species is apparently more abundant in winter, being only a straggler in the summer months. The only one that I have seen was collected on the Goose Island banks on July 18, 1939.

Puffinus creatopus. Pink-footed Shearwater. This bird appears to be rare off the coast of British Columbia. In the month of July, 1937, on the Goose Island banks, I saw two large Pink-footed Shearwaters. On April 28, 1940, I saw a similar shearwater off Kyuquot in company with some Sooty Shearwaters. This particular bird passed by several times and little doubt need be entertained that it was a Pink-footed Shearwater.

Puffinus opisthomelas. Black-vented Shearwater. On July 15, 1940, off Cape Scott, Vancouver Island, I saw a shearwater that was decidedly smaller than the accompanying Sooties. It was at quite a distance, but the black back and light underparts contrasted sharply. I refer it to this species.

Puffinus griseus. Sooty Shearwater. In 1940 my first spring record for this bird was on March 21

off Kyuquot, Vancouver Island. At this time several were seen at a distance, apparently scouting for food. On each successive day they were more abundant until on the first of April the flocks had attained considerable proportions, although not to be compared with the numbers seen later off Cape Scott and other favorable feeding grounds in the summer. These birds remain on the coast until late October, when they once again disappear to the south.

The Sooty Shearwater appears to prefer to catch most of its food itself but sometimes it will follow the halibut boats and pick up the most palatable scraps from the cleaning tables. At certain stages of the tide, most often low water slack, the sand lance (*Ammodytes personatus*) and "red feed," a small shrimp-like animal, appear on the surface in astounding quantities. At such times the large flocks of shearwaters reap a harvest and their feeding process is indeed most interesting. The foremost ranks of the birds dive headlong into the sea, the next rank pass over and also dive until the

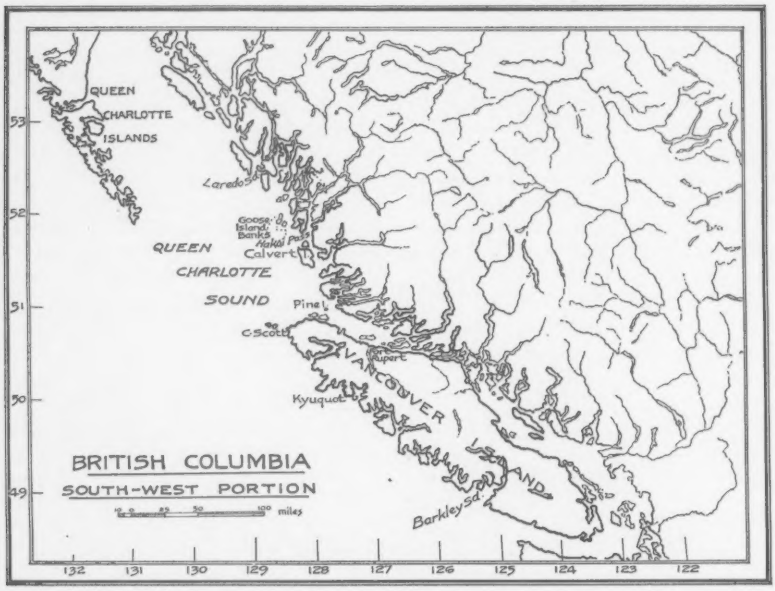

Fig. 10. Map showing location of areas where pelagic birds were observed along the coast of British Columbia.

last of the flock dives in what now can be called the front rank. By this time the first to enter the water come to the surface, swallow their catch, if successful, and, immediately taking off, fly over the sumberged flock and once again plunge in just ahead. In this manner the rear is constantly passing over the center and entering the water again in front. Seen from a distance a large flock takes on the appearance of a small cloud progressing along the surface of the ocean with a peculiar rolling motion. When satiated, the flock will usually form into a raft of birds and at such times they hardly bother to move out of the way of a slowly moving trolling boat.

Puffinus carneipes. Pale-footed Shearwater. P. M. nos. 8790, 8791, 8792, 8793, 8794. This native of New Zealand and its environs was first observed on the northeast corner of the Goose Island banks on July 31, 1937. On account of bad weather, however, no specimens were obtained. On July 8 and 18, 1939, trips were made to the same vicinity in company with Mr. and Mrs. T. T. McCabe and on both occasions specimens were collected. In fact, on July 18 this species appeared to be the most numerous shearwater in that area. It is interesting to note that during 1940 I observed thousands of Sooty Shearwarters in the Cape Scott area, but not once could I positively identify a Pale-footed Shearwater among them. This gives rise to the supposition that the population of Goose Island banks is a regular but isolated summer population.

Oceanodroma leucorhoa beali. Beal Petrel. This little petrel is not seen abroad much in the day-

time. It may therefore be far more numerous than these records indicate. One specimen was collected on July 4, 1937, on the Goose Island banks. The species was also observed once on July 18, 1940, in the Cape Scott area on a very foggy day. It is reported to breed in considerable numbers on the Storm Islands, Queen Charlotte Straits.

Oceanodroma furcata. Forked-tailed Petrel. This is the most conspicuous if not the most numerous petrel observed in the area. It was first seen in the latter part of May off Kyuquot and was quite numerous in the Cape Scott and Queen Charlotte areas during July and August. This bird is most commonly observed in dull and foggy weather and appears to have a marked dislike for bright and sunny weather. The Forked-tailed Petrels congregate in small flocks along the tide lines where they appear to be feeding. Occasionally I have had them follow the boat when dressing fish and at such times they pick up only the smallest and softest portions of the fish offal. These birds appear to have no fear of man and upon one occasion I attracted a number of them to the stern of the boat, while at anchor, by feeding them small scraps of halibut liver. They became so intent upon the food that I was able to catch several by hand. They scratched and bit fiercely but upon being released returned immediately to their meal only to be caught again. I was most interested to see them dive quite effortlessly when a morsel had sunk beyond reach.

Stercorarius pomarinus. Pomarine Jaeger. P. M. nos. 8788, 8789, 8834, 8835. We collected specimens of this bird on July 18, 1939, when considerable numbers were seen on the northwest portions of the Goose Island banks. At no other time have I been fortunate enough to see a migration of this species.

Stercorarius parasiticus. Parasitic Jaeger. This jaeger is an abundant fall migrant, appearing in the Queen Charlotte Sound area about the middle of August. By the first of September it is a conspicuous if not numerous member of the bird population, much to the distress and annoyance of the small gulls.

Stercorarius longicaudus. Long-tailed Jaeger. P. M. no 8787. One specimen was taken on July 18, 1939, near the northwest part of the Goose Island banks.

Catharacta skua. Skua. One specimen was collected on the Goose Island banks on July 18, 1939. It was also reliably reported from Laredo Sound in June, 1939.

Rissa tridactyla pollicaris. Pacific Kittiwake. P. M. nos. 8784, 8838. I found this little gull quite numerous off Cape Scott during April, 1939. Some individuals stayed as late as the first of June when I collected a specimen off Calvert Island. In 1940 I saw only two small flocks, on the 12th and 16th of April off Kyuquot.

Xema sabini. Sabine Gull. P. M. no. 8869. These birds appear to be regular if not numerous fall migrants in the Queen Charlotte Sound area. My first record is for August 11, 1937, at Hakai Pass. Later, on August 16 in the same year, I collected three and saw several more off Pine Island; others were seen off Fort Rupert. On June 25, 1939, I saw a flock of five adults in Laredo Sound. In August of 1939 Mr. T. T. McCabe and I collected specimens in Laredo Channel and later in the same year I observed others. I again saw them in August of the following year in the Cape Scott area.

Provincial Museum, Victoria, British Columbia, August 11, 1941.

THE PTERYLOSIS OF THE ANDEAN CONDOR

By HARVEY I. FISHER

The opportunity to investigate the pterylosis of the Andean Condor (*Vultur gryphus*) was provided through the courtesy of Mr. William Vogt of Lima, Peru, who shipped an alcoholic specimen to the Museum of Vertebrate Zoology late in September of 1941. Two study skins, a male and a female, were also available. It is especially desirable to study the feather tracts of this species to see whether they conform with the cathartid pattern as defined in previous papers on *Cathartes*, *Gymnogyps*, and *Coragyps*. Then too, it is of interest to compare the tracts in the two largest vultures, *Vultur* and *Gymogyps*.

No attempt is made to present a complete picture of the pterylosis of the Andean Condor. Only major points of difference and of significant similarity in pattern compared with that of the California Condor as given by Miller and Fisher (Condor, 40, 1938:248-256) will be mentioned. Reference may be made to Compton (Univ. Calif. Publ. Zool., 42, 1938:173-211) for a detailed study of the pterylosis of the Turkey Vulture and to Fisher (Auk, 56, 1939:407-410) for the Black Vulture.

The alcoholic specimen is perhaps a bird in its third year. No birds known to be immatures are available, and no description of the immature plumage has been found. However, a rough estimate of the age may be obtained by comparison with the California Condor. In the latter the pure white does not appear in the wing before the bird molts in its second summer. Thus, if such comparison is valid, the presence of pure white in the specimen of *Vultur* gives evidence that it is over one year of age. The fact that some of these white feathers were being replaced adds at least one year, making the bird over two years of age.

Capital tract.—This region is greatly variable in the different genera. In *Vultur* the head is more completely covered than in any other genus, except possibly *Coragyps*. The various feathered areas are not sharply defined, and the bristle-covered regions are confluent except for small, localized apteria. No plumaceous feathers are present; all the feathers are hair-like bristles set in groups of 1 to 8.

In dorsal view the frontal feathered area on each side may be seen to extend forward almost to the nostril. The bristles are 3 to 5 mm. long and 1 to 2 mm. apart. In the anterior dorsal part of the frontal region is a V-shaped space devoid of feathers. The apex of this space extends posteriorly almost to a transverse line drawn between the anterior corners of the eyes. In the male this part of the frontal area is occupied by the caruncle which is nude except for a few bristles basally along its posterolateral margins. It is interesting that the female also shows this bare area, although it may be less completely nude in the dorsal region just anterior to the eyes. In contrast, the frontal area of *Gymnogyps* is covered by short, close-set, plumaceous feathers and there are feathers anterior to the nares.

The bristles of the coronal area are the shortest (2 to 5 mm.) on the head and are approximately 2 mm. apart. In the anterior half of the occipital region the bristles are longer (4 to 6 mm.) and are spaced at intervals of 1 to 3 mm. However, in the posterior part of the occipital region the bristles begin to shorten and are more widely separated. This trend toward shorter and fewer bristles posteriorly on the dorsal and lateral surfaces of the neck reaches its climax in the dorsal cervical region. Just anterior to the white collar there are few bristles, and these are extremely short. *Gymnogyps* has only two small patches of weak bristles in the coronal area.

In contrast to the other New World vultures studied, *Vultur* has feathers in the loral region only in its anterodorsal part where a bristle-covered area is confluent with the frontal region. In *Cathartes* and *Gymnogyps* the loral region is the most heavily feathered, but in *Coragyps* the condition is somewhat similar to that in *Vultur*. The superciliary zone has shorter (1 to 2 mm.) and more closely-set (less than 1 mm.) feathers than in the contiguous frontal region. Upper and lower ocular apteria meet widely posterior to the eye and are continuous anteriorly with the loral apterium. *Vultur* and *Gymnogyps* lack eyelashes, but *Cathartes* and *Coragyps* agree in having a single incomplete row on the upper lid and two rows on the lower eyelid.

An auricular apterium 2 cm. in diameter surrounds the auditory orifice. On all sides of this apterium, except anteroventrally, the bristles (3 to 6 mm. long) are close-set but are not in definite rows. This is the typical cathartid pattern. In the rest of the auricular and postauricular areas bristles are spaced as in the anterior occipital region but are finer and shorter. There is evident here the decreased covering posteriorly as seen in the dorsal part of the head and neck.

The anterior two-thirds of the interramal and malar regions are bare, but there is no submalar apterium. Interramal and submalar bristles are 8 to 12 mm. long, are semi-plumaceous and are set 2 to 3 mm. apart. Dorsally the feathers gradually decrease in length. Posteriorly they decrease both in length and in numbers. Short, fine bristles may or may not extend down into the anterior one-third of the ventral cervical region. All cathartids studied have interramal apteria. *Vultur* has long, close-set, semi-plumaceous feathers (the longest on the head) in the posterior interramal and submalar areas. Only sparse bristles are to be found in the submalar regions of the other genera.

Spinal tract.—Relatively high on the neck *Vultur* has a band of white, downy feathers on the dorsum that extends ventrally to the junction of the dorsal and ventral cervical areas. No feathers of any type are found between the ventral ends of this collar. The white, downy collar is about 3 cm. in depth and 3 to 5 cm. wide. Dorsally the collar may be extended posteriorly about 8 cm. by black-tipped, but otherwise white, down. Also, black contour feathers posterior to the collar and lateral to the dorsal down area may have extensive, white, downy barbs in their basal thirds.

Posterior to the white collar and extending almost to the shoulders is a black ruff of feathers. They are typical contour feathers, 5 cm. long in the forepart of the ruff and 10 cm. long at the point where the ruff blends with the contour feathers of the shoulder. The feathers project anteriorly and laterally to cover part of the ventral cervical apterium. This ruff probably corresponds to the ruff of *Gymnogyps*, but the feathers are shorter and are not lanceolate. The formation of this group of feathers in *Vultur* is more reminiscent of the vestigial ruff found in *Coragyps* and *Cathartes*. The white, downy collar of *Vultur* apparently represents down feathers that are lost in the other genera.

Laterally just behind the shoulders an apterium 3 to 4 cm. wide separates the spinal tract from the humeral tract and the marginal coverts of the wing. This apterium extends its apex on to the lateral surface of the neck and thus effects a partial separation of the spinal and ventral tracts. There is no other lateral cervical apterium. Placement of feathers in the spinal tract is about the same as in *Gymnogyps*. A narrow, irregular, median apterium starts just posterior to the shoulders but is interrupted in the dorsal region by large feathers set across the midline. Feathers of the dorsal region and the anterior part of the pelvic region are about 4.5 cm. long, semi-plumaceous and irregularly placed. In the pelvic region no feathers are placed as far laterally as they are in *Gymnogyps*. Posteriorly the feathers become more normal and longer. Immediately in front of the oil gland is a group of 7 large feathers, the longest of which measures 11.5 cm. These feathers project back over the completely nude oil gland. Such greatly elongated feathers anterior to the oil gland have been found only in *Vultur*.

Ventral tract.—The ventral apterium is uniformly wider than in other cathartids studied. It is continuous anteriorly with the ventral cervical apterium which extends forward past the anterior edge of the white collar. There is no constriction in width in the cervical region as in *Gymnogyps*. At the anterior end the apterium is 7 to 9 cm. wide; it decreases gradually and is narrowest (2.5 cm.) near the highest crest of the sternal keel. Posteriorly it reaches a maximum width of 5 cm. in the middle of the abdominal region. The sternal apterium is large and, as in *Gymnogyps*, is enclosed laterally by a single row of large feathers.

In the anterior part of the ventral tract the feathers are 10 to 13 cm. long and are for the most part typical feathers. Some are lanceolate, as in the axillar region where they may attain a length of 20 cm. Posterior to the region of the sternal apteria all feathers are lanceolate and elongated. A triple row of feathers on either side of the ventral apterium extends back to within 2 cm. of the cloaca. Immediately in front of the cloaca some lanceolate feathers are 16 cm. long; they project posteriorly beneath the cloaca and to the bases of the major under tail coverts.

In New World vultures the ventral tract is uniform as regards feather placement. The major differences are to be found in the relative development of the sternal apterium, the number of rows of feathers lateral to this apterium and the number of rows of feathers that extend caudally to the anus.

Caudal tract.—In *Vultur* semi-plumaceous, down feathers are more abundant about the anus than in *Gymnogyps;* there are two complete circlets and outside these three additional circlets that are incomplete anteriorly. At the dorsolateral margin of the circlets are three lanceolate feathers, the longest of which measures 11 cm.; these constitute a vestigial postpelvic region. There are only a few down feathers in the postventral tract. *Vultur* and *Gymnogyps* agree in having at least one complete anal circlet; in *Cathartes* and *Coragyps* the circlet is incomplete.

The longest of the six rectrices measures 37 cm. There are six major under tail coverts and three or four minor coverts but no indication of another row as in *Gymnogyps*. A remarkable fact is the

length of the major under coverts; they are 26.5 cm. long and extend two-thirds the length of the rectrices. The longest of the six major upper tail coverts measures 13 cm. There may or may not be a feather representing the outer minor covert of the first row of minor upper tail coverts.

Patagia are absent from the bases of the rectrices in all the cathartids examined.

Humeral tract.—This is identical with that of *Gymnogyps* even to the length of the longest feathers on the posterior row (see Miller and Fisher, *op. cit.* :253).

Alar tract.—The design of placement is the same as in *Gymnogyps*, but there are major increases in the number of tertiaries and secondaries. There are 13 tertiaries as compared to 10 in *Gymnogyps*, and 9 in *Cathartes* and *Coragyps*. The longest measures 20.5 cm. and is in the middle of the series; the shortest is 15 cm. and is most medial. Twenty-five secondaries are present as compared to 22 in *Gymnogyps*, 19 in *Coragyps* and 18 in *Cathartes*. The two medial secondaries are 34 cm. long and are only 3 cm. shorter than the longest; the secondaries are unusually uniform in length. Eleven primaries are found in all cathartids; the lateral or eleventh primary is always vestigial. In the alcoholic specimen of *Vultur* this primary was only 7 cm. long, or about one-half the length of its covert. The longest primary (63 cm.) was in the middle of the series.

Ten greater upper coverts are found on the hand (10 in *Gymnogyps*). There are 8 middle coverts (7 in *Gymnogyps*, 8 in *Cathartes*), beginning distal to greater covert three. Coverts on the humerus are small and are increased in number to correspond with the number of tertiaries. Secondary coverts have also increased. No disruption of pattern has been caused by the greater number of tertiaries and secondaries. There are no claws on the pollex and no carpal remex although there is a carpal covert. The longest of the 4 large alular feathers measures 15 cm.

Dorsally the secondaries and tertiaries with their greater and lesser coverts present an almost universally white appearance. In the distal two-thirds of the outer vane of the lateral secondaries there is a white edging (5 mm. wide) except at the tip which is black in all the secondaries. Medially the white edging becomes wider, and the distal black tip becomes shorter. Midway of the series of secondaries the outer vane is entirely white except for a distal edge of black. The amount of white increases until in the most medial secondaries the only black remaining in either vane is a distal tip 0.5-1.0 cm. wide; even this may be absent in the outer vane.

The black bases of the secondaries are covered by the white tips of the greater coverts which also show an increased amount of white medially. There is a short, white tip on the distal coverts; the proximal coverts are almost pure white. The rows of lesser coverts are white-tipped and cover most of the black of the greater coverts. The tertiaries are white dorsally and gray ventrally.

Femoral tract.—In *Vultur* this tract is similar to that in *Gymnogyps*, *Cathartes* and *Coragyps*. The essential difference is the greater length (18 cm.) of feathers in the posterior part of the tract.

Crural tract.—The pattern is the same in all the vultures examined. However, *Vultur* does not have feathers as far mediad as *Gymnogyps*; the apterium between the crural and the sternal tracts is wider. Feathers are somewhat more numerous ventrally; especially is this true of the downy, lanceolate feathers. Semi-plumaceous feathers on the proximal part of the shank are 4 cm. long. They increase in length down the tibia and reach a maximum of 9.5 cm. a few centimeters above the tibial malleoli. From this point they decrease to 2 cm. in length at the tip of the tibia. On the dorsal surface some feathers attain a length of 11 cm.

SUMMARY

The feather tracts of *Vultur* are characterized by the most complete head covering of any cathartid vulture, by a greater number of remiges, and by a remarkable elongation of certain feathers, especially in the subaxillar area, in front of the oil gland, and anterior to the anus. The major under tail coverts are also elongated.

This study of the pterylosis of *Vultur gryphus* has shown that the cathartid pattern as described by Compton applies to this species in most respects. Features of the pterylosis of the Cathartidae which differentiate the New World vultures from other falconiforms are: absence of a submalar apterium, vestigial or absent lateral cervical apterium, wide dorsal cervical region, continuous dorsal and pelvic regions, fused sternal, axillar and subaxillar regions, a row of large feathers in the posterior subaxillar area, a definite sternal apterium, a femoral tract consisting of 5 to 7 longitudinal rows of lanceolate feathers on the posterior margin of the thigh, 4 alular quills, absence of a patagium about the bases of the rectrices, an essentially nude oil gland and a reduced number of lower tail coverts.

Museum of Vertebrate Zoology, Berkeley, California, October 9, 1941.

ADDITIONS TO THE DISTRIBUTIONAL LIST OF THE BIRDS OF BRITISH COLUMBIA

By ALLAN BROOKS

It has been my intention for some time past to bring out a supplement to "A Distributional List of the Birds of British Columbia" by Brooks and Swarth (Pacific Coast Avifauna No. 17, 1925). There have been many additions to this list since its publication; ranges of species have been extended, subspecific concepts have changed, and at least one subspecies, *Pooecetes gramineus affinis*, should probably be dropped from the British Columbia list.

Also, it may be advisable to include the large area in the northeastern corner of the Province lying to the east of the barrier of the Rocky Mountain chain. This would be a large undertaking and it may possibly be best to get out an entirely new list using the order of the latest A.O.U. Check-list.

In our original list published in 1925 the northeastern area lying to the east of the Rockies was left out with a definite purpose. It was not then politically administered by the British Columbian government, it lay beyond a great natural boundary, and it was realized that when this region was properly worked it would include nearly every species of bird found in the province of Alberta.

The following brief list may be regarded as an interim supplement against the time when an adequate list may be compiled. It includes absolute additions only. Some forms which have been described since the publication of the original list are not included, as the writer feels that although they have been declared valid by the committee of the A.O.U. Check-list of 1931, their actual status has not been substantiated. *Falco columbarius bendirei* Swann is a case in point.

A sight record (Swan Lake, Vernon, April 15, 1932) of the Falcated Duck (*Eunetta falcata*) is not included in the list; although this bird was thoroughly identified and all its markings recognized, there is the possibility that it may have been an escaped bird, as many are kept in captivity in California. Several males of the European Teal (*Nettion crecca*) have also been seen in the early spring of 1941 at Masset, Queen Charlotte Islands, by R. M. Stewart. This duck will certainly be found to be a regular, though scarce, migrant along the coast before long.

Gavia adamsii. Yellow-billed Loon. Regular winter visitant along coast line in small numbers. Adult male taken at Comox, Vancouver Island, January 9, 1929, by Brooks; im. ♀ taken at Hardy Bay, Vancouver Island, April 14, 1936, by A. Peake; one taken at Atlin Lake, B.C., October, 1930, by R. M. Stewart.

Larus pipixcan. Franklin Gull. Two juveniles taken at north end of Okanagan Lake by Brooks, August 3, 1938, while migrating with Bonaparte Gulls; others seen.

Sterna forsteri. Forster Tern. One adult taken at north end of Okanagan Lake by Brooks; a non-breeding bird, June 24, 1928; 2 others seen.

Puffinus carneipes. Pale-footed Shearwater. Probably a regular migrant to the west coast of British Columbia from its home in the Southern Hemisphere. Nine taken at Goose Island banks by P. W. Martin, July 8 to 18, 1939. Others seen by R. M. Stewart north of Queen Charlotte Islands and one in Victoria Harbor by Capt. G. D. Sprot.

Somateria v-nigra. Pacific Eider. Hardy Bay, Vancouver Island, October 26, 1934; young ♀ received from Arthur Peake, no. 7933 Brooks Collection.

Somateria spectabilis. King Eider. Hardy Bay, Vancouver Island, October 18, 1938; young ♂ received from Arthur Peake, no. 8952 Brooks Collection.

Pisobia fuscicollis. White-rumped Sandpiper. Atlin, May 24, 1931; ♂ taken by R. M. Stewart; specimen in Brooks Collection.

Erolia testacea. Curlew Sandpiper. Masset, Queen Charlotte Islands, July 31, 1936; ♂ taken (Brooks, Condor, 39, 1937:177).

Limosa lapponica baueri. Pacific Godwit. Cloverdale, Fraser Delta, October 30, 1931; juvenal ♂ seized by game warden and specimen (mounted) in office of Game Board, Vancouver; now in collection of J. A. Munro (Condor, 37, 1935:178).

Limosa haemastica. Hudsonian Godwit. Atlin, May 7, 1932; adult ♂ taken by R. M. Stewart; specimen now in collection of Allan Brooks.

Sphyrapicus thyroideus nataliae. Natalie Sapsucker. Specimens from East Kootenay are identified by Cowan as this subspecies (Condor, 40, 1938:128, 129).

Dryobates villosus sitkensis. Sitka Hairy Woodpecker. Coast of northern British Columbia (A.O.U. Check-list). A migrant taken at Campbell River, Vancouver Island, March 4, 1938, no. 8736 Brooks Collection, seems to be this form; two outer rectrices broadly barred with black.

Tyrannus melancholicus chloronotus. Lichtenstein Kingbird. One specimen, now in the Provincial Museum, taken at Renfrew, Vancouver Island, February, 1923, by I. G. French (Kermode, Condor, 30, 1928:251).

Sayornis nigricans nigricans. Black Phoebe. Vancouver, November 11, 1936; ♀ taken by R. A. Cumming; skin in Provincial Museum (Cowan, Condor, 41, 1939:123).

Icterus galbula. Baltimore Oriole. Chilliwack, June 11, 1927; adult ♂ taken by R. M. Stewart; now in Provincial Museum. Although nearly typical *galbula*, it has a trace of *bullockii* blood as shown by a faint yellow supercilium; the lesser wing coverts are yellow as in *galbula*.

Carpodacus mexicanus frontalis. Common House Finch. This finch has invaded southern British Columbia in the last six years and is now a fairly common summer resident at several localities. It was first reported by S. J. Darcus in the spring of 1935 as nesting at Penticton at the south end of Okanagan Lake; I saw several there on May 27, 1936, and found a nest from which the young had flown, leaving one addled egg. Found nesting at Victoria, Vancouver Island (Cowan, Condor, 39, 1937: 225). Seen regularly in the northern Okanagan District from 1939 on, becoming common in 1941.

Spinus psaltria hesperophilus. Green-backed Goldfinch. A specimen taken in a banding trap with Pine Siskins at Indianpoint Lake, Cariboo District, by Mrs. T. T. McCabe. I can find no published record of this, but there can be no doubt as to its reliability.

Amphispiza nevadensis nevadensis. Northern Sage Sparrow. Lulu Island (mouth of Fraser River), October 2, 1930 (R. A. Cumming, Murrelet, 13, 1932:13); specimen in Provincial Museum. I have examined this skin and it is definitely the northern subspecies; it is a female in second plumage, not a juvenile.

Hedymeles melanocephalus papago. Rocky Mountain Grosbeak. Although *papago* is not the correct name of this subspecies, it is here used to conform to the nomenclature of the Fourth Edition of the A.O.U. Check-list. The eastern or Rocky Mountain subspecies of the Black-headed Grosbeak is the nesting form of the southern interior of the Province. Three specimens are in the Brooks Collection.

Piranga erythromelas. Scarlet Tanager. Comox, Vancouver Island, November 17, 1926; im. ♂, in second plumage, taken by H. M. Laing and now in his collection.

Dendroica castanea. Bay-breasted Warbler. A specimen taken at Indianpoint Lake, Cariboo District by T. T. McCabe (H. W. Grinnell, Condor, 32, 1930:306). As this warbler has been found nesting at the eastern foot of the Rocky Mountains just east of the Cariboo District, it will probably be found to be a summer resident in this district as are such eastern species as Magnolia, Black-poll and Tennessee warblers.

Mimus polyglottos polyglottos. Eastern Mockingbird. The first record for the mockingbird in British Columbia was published by Kenneth Racey (Canadian Field Nat., 47, 1933:159). Mr. Dennis Ashby has sent me a female taken at Duncan, Vancouver Island, January 20, 1940. This proves to be the eastern subspecies; identification confirmed by Dr. Alden H. Miller.

Okanagan Landing, British Columbia, October 30, 1941.

FROM FIELD AND STUDY

Spotted Owl Nesting in Colorado.—One specimen taken and three sight records have established a place for the Spotted Owl (*Strix occidentalis*) in the Colorado state list. C. E. H. Aiken had a specimen brought to him in 1875 that was killed near Colorado Springs; this is now in the Colorado College collection. He also saw one in the same region in June or July of 1873. From this latter observation Aiken assumed that the species probably bred that year. Two other sight reports come from the extreme southern and western parts of the state (La Plata and Costilla counties).

These data have led many subsequent authors (A.O.U. Check-list, F. M. Bailey, Peterson, Sclater, and others) to assume broadly that the Spotted Owl ranges north to include southern Colorado. Bent (U. S. Nat. Mus. Bull. 170, 1938:207) has regarded the presence of this bird in the state list as resting on "slender evidence."

Consequently it was with great interest that I found two juvenal Spotted Owls in a live animal exhibit near Hartsel, Park County, in the very center of Colorado, on September 1, 1941. The birds were being exhibited as "Rock Owls," and I was told by the owner that they came from a ranch approximately forty miles north of Hartsel, where two boys had taken them from the nest. The nest location was described as "back in the timber where there are plenty of rocks," obviously in the Transition Zone, or higher. No more could be learned about the conditions of the find.

I took careful notes at the time. The young birds were of fairly large size, though not as large as the abundant Horned Owls; the large head, at this stage heavily downed, the black irises, dark feathers of the breast, and white in the wings, along with the familiar build of a Barred Owl, made the identification quite positive.

The interest in this observation lies in the fact that it is the first definite indication of the Spotted Owl nesting in Colorado and that it comes from what is best described as north-central Colorado, more than 180 miles north of the New Mexico line. The locality is in the Transition Zone, the lowest life-zone in the area. The record may be of some value also in confirming the assumptions that the Spotted Owl occurs in the more southerly portions of the state.—SAMUEL W. GADD, *Colorado Springs, Colorado, October 4, 1941.*

Another Wilson Snipe Perches on a Telephone Pole.—The recently published record by Messrs. Cottam and Williams of a Wilson Snipe (*Capella delicata*) perching on a telephone pole (Condor, 43, 1941:293) recalls a corroborative observation by the writer. The field notes covering this record are summarized herewith: on June 8, 1941, about one mile north of the town of Glacier Park, Montana, I noted, with surprise, a Wilson Snipe which flew up from a marshy meadow adjacent to the highway and perched on the top of a telephone pole approximately 20 feet in height. While perched there the bird continually gave vent to its characteristic "guinea hen" call—the notes being rapidly uttered about 12 times followed by a pause and then a repetition of the same. It was 11:40 a.m.; cloudy and cool. Passing cars did not freighten the snipe, but when the observer's car was driven to within 75 feet, the bird flew from the pole back into the marshy meadow once more, where, now out of sight, it continued to give its call.—E. LOWELL SUMNER, JR., *Fish and Wildlife Service, San Francisco, California, November 26, 1941.*

Green Heron at Tacoma, Washington.—While observing birds on September 7, 1941, on the tide-flats at Tacoma, Pierce County, Washington, the writer was surprised to flush a Green Heron (*Butorides virescens*) from one of the brackish tidal sloughs draining the area. The "fly-up-the-creek" did just that, keeping out of gunshot by moving on each time I came into sight, despite careful stalking. At one time it was watched through binoculars as it caught a minnow in the shallows of a mud bar, appearing scarcely more impressive than two neighboring Greater Yellow-legs (*Totanus melanoleucus*). Finally it perched on a wooden bridge about a quarter of a mile from where it was first seen. By circling widely I was able to place the timbers of the bridge between us, and so at last got within easy range. The bird proved to be a female of the year, of the race *anthonyi*, with the following dimensions: length, 18.67 inches; wing, 7.60; tail, 2.50; culmen, 2.09; weight, 7.7 ounces. Dissection showed it to be quite fat, and the stomach contained one two-inch sculpin (cottid). The skin is now in my collection.

This specimen constitutes the first record of the species in Pierce County. The species has been collected but once before in the state of Washington; a juvenal male was taken August 20, 1939, two miles west of Chinook, Pacific County, by Hubert C. Hall (Larrison, Murrelet, 21, 1940:1-2). In addition to these there are sight records of Green Herons for King (April 1, 1916; August and September,

1939, 1940, 1941), Thurston, Cowlitz (May 31, 1938), and Walla Walla counties (*ibid.*; and Slipp, MS).

Jewett (Condor, 41, 1939:33) and Gabrielson and Jewett (Birds of Oregon, 1940:110) have observed the increasing regularity of the species in western Oregon in recent years, and it seems not unlikely that this heron may in the future extend its breeding range to Puget Sound. So far as I am aware, however, recent records in the latter area are all based on vagrant fall juveniles.—John W. Slipp, *Washington State Museum, Seattle, October 20, 1941.*

Pigmy Nuthatch in Oklahoma.—Several montane species of birds occur in Oklahoma solely because the Black Mesa, a spur of the Rocky Mountains, extends into the extreme northwestern corner of the Panhandle (see Sutton, Ann. Carnegie Mus., 24, 1934:1-50). The writer is now able, through the courtesy of Mr. George H. Lowery, Jr., of the Museum of Zoology of Louisiana State University, to add another such species to the list—the Pigmy Nuthatch of the race *Sitta pygmaea melanotis*. Mr. Lowery himself took the specimen, a breeding female, with well-defined brood-patch. It was collected near Kenton, Cimarron County, in the very shadow of the Black Mesa, on May 22, 1937. The whole region was swept by a black dust storm on the preceding day—a cataclysm which the writer, who was present at the time, will never forget!—but, granted that the nuthatch could have been blown in, or become lost in the sudden darkness, it is unlikely that it was far from its nest at the time it was collected. It is now at Cornell University, where most of the writer's collections from Oklahoma are housed.—George Miksch Sutton, *Cornell University, Ithaca, New York, November 3, 1941.*

Woodpecker Efficiency.—Recently while working through solid second-growth and slashed forest in central Ontario, I was struck by the universality of woodpecker workings in contrast to the apparent scarcity of woodpeckers themselves. The best part of a day of more than casual observation brought but a single Downy Woodpecker to attention. The next day produced a Pileated vanishing in the distance, but that is a much rarer species, the sight of it being somewhat of a red letter event. Yet every dead stub was more or less riddled with woodpecker excavation, some trunks being worked almost to destruction, and scarcely a dead branch or streak of diseased bark upon living timber had escaped woodpecker scoring. The season of the year, late September, might have something to do with the apparent dearth of the birds, but remembered experience of other days in the same neighborhood indicates that at no other time or season is the woodpecker population very greatly increased. On estimate, and without close censusing, I would say that the average population of woodpeckers in the area would rarely exceed a pair to the square mile, yet it is evident that little timber of prospective productivity escapes their scrutiny and exploration. Undoubtedly the comparatively few woodpeckers present must destroy an important proportion of wood borers and be a very considerable control upon their indefinite increase.—P. A. Taverner, *National Museum of Canada, Ottawa, October 2, 1941.*

Some New Bird Records from Oregon.—It is now a little over six years since the manuscript for the "Birds of Oregon" was prepared by Gabrielson and Jewett. With the exception of a few notes and one addition to the list of birds, little was added to the original manuscript before it went to press in March of 1940. Several new races of birds have been taken or reported by different workers in addition to those known in 1935. The following notes add a little more to our knowledge of Oregon birds.

Lophortyx californica brunnescens. Coastal California Quail. On page 603 of the "Birds of Oregon," in the hypothetical list, mention was made of a specimen of this quail (under the name *L. c. californica*) in the U. S. National Museum collected by Newberry in the "Willamette Valley, Oregon." The locality is doubtful in view of the fact that many of Newberry's labels are indefinite and we know he collected many birds in California at about the same time. Furthermore, the race of quail now in the Willamette Valley is not *L. c. brunnescens*. During the early morning of March 14, 1940, while driving east from Coos Bay through the heavy rain forests of the humid coast belt near Bridge, Coos County, Oregon, I picked up a dead adult male *L. c. brunnescens* (for the use of this name see Grinnell, Condor, 33, 1931:37) from the middle of the road where it evidently had been killed by a passing automobile just prior to my arrival on the scene. The body was still warm and limp. The plumage is almost identical with a February male from San Mateo County and with an April male from Alameda County, California. It is the only true example of this race that I have seen from Oregon.

Pluvialis dominica fulva. Pacific Golden Plover. While driving along the west shore of Tillamook Bay a short distance south of Bayocean, Tillamook County, Oregon, on September 28, 1940, I kept a casual lookout for birds. Noting a small flock of Black-bellied Plovers, I stopped the car for a better study of the group through binoculars. No sooner was the glass raised than a Golden Plover

was seen standing close to one of the larger Black-bellied Plovers. Even with this excellent chance for comparison between the two species the Golden looked exceptionally small. The bird was collected at once and proved to be a typical female *Pluvialis dominica fulva* in fresh fall plumage. It compares almost exactly in size and color with two females in the writer's collection from South Rinkin Island and Roqugo River near Tokyo, Japan, and with others in the U. S. National Museum. So far as I can ascertain, this race of the golden plover has not been recorded from Oregon before.

Limnodromus griseus hendersoni. Interior Dowitcher. On receipt of a paper by Dr. Robert Orr on the subspecific status of dowitchers in California (Condor, 42, 1940:61-63), I lost no time in studying the dowitchers in my collection. Of the 14 skins available from Oregon, 8 are in full spring plumage, 4 are fall birds of the first year, and 2 are August adults changing into winter plumage. Seven of these birds are unquestionably of the interior race, *L. g. hendersoni.* Five are spring adults from Astoria, Clatsop County, and two are immature males taken in August on the coast of Lincoln County, Oregon. Five of these birds, four adults, and one immature, were recently compared with skins in the U. S. National Museum and were found to match this newly described interior race.

Stercorarius longicaudus. Long-tailed Jaeger. On page 604 of the "Birds of Oregon" we stated in regard to this bird that there are no "existing specimens so far as we have been able to learn." This was our reason for placing this species in the hypothetical list. On September 8, 1940, Mrs. W. B. Holden of Portland, while walking along the ocean beach near Delake, Lincoln County, Oregon, found a juvenal female in first fall plumage in a dying condition. The bird was brought to Portland and presented to me. On September 21, 1940, while Mrs. Jewett and I were patrolling the ocean beach about three miles south of Seal Rocks, Lincoln County, Oregon, we saw a lone Long-tailed Jaeger in juvenal plumage standing on the beach just at the edge of the surf at low tide. It allowed a close approach and was studied with binoculars at a distance of about 50 feet, which allowed me to identify the bird to my own satisfaction. Having no gun, the bird was not taken. Returning along the same beach on September 23 we found a perfectly fresh juvenal female jaeger dead on the beach within 100 yards of where the specimen was studied on the 21st. Size and plumage were the same, and we have every reason to believe it was the same bird seen two days before. Both these birds were prepared as study skins and are now in my collection.

Tyrannus vociferans. Cassin Kingbird. On page 605 we mentioned the sight records of this species by A. W. Anthony at Beaverton and by Dr. A. G. Prill in the Warner Valley and decided that these records were unsatisfactory because no specimens were taken. Recently an unrecorded specimen of *Tyrannus vociferans* was sent to me by the collector, Overton Dowell of Florence, Oregon, in whose collection the specimen now reposes. The label reads "male?," but as the primaries are not at all attenuated and as there is no trace of the orange-red crown, I am inclined to believe that the bird is a young female. It was collected by Overton Dowell at Mercer, Lane County, Oregon, on August 4, 1935, and is the first authentic specimen of the species taken in Oregon.

Sayornis nigricans nigricans. Black Phoebe. This is another species in the hypothetical list, page 605; it was placed there because we believed the records of Newberry and O. B. Johnson to be unsatisfactory. Again credit is due to Mr. Overton Dowell for placing before us an Oregon-collected specimen of *Sayornis nigricans nigricans*, a new bird for the State. Mr. Dowell collected the bird on his ranch at Mercer, Lane County, Oregon, on June 1, 1936. It is now in his collection at Florence, Oregon.—STANLEY G. JEWETT, *Portland, Oregon, September 25, 1941.*

The Black Pigeon Hawk in Colorado.—A beautiful adult Black Pigeon Hawk (*Falco columbarius suckleyi*) (Colo. Mus. Nat. Hist. no. 22391) was collected December 14, 1940, by Lloyd Triplet at Weldona, Morgan County, Colorado. As the bird was so far from its normal range and was the first of its race to be taken in Colorado, the skin was submitted to Messrs. George Willett, Stanley Jewett, and Herbert Friedmann, and all concurred in the identification.—ALFRED M. BAILEY, *The Colorado Museum of Natural History, October 1, 1941.*

A Raptor Tally in the Northwest.—A peculiar localization of raptors was observed last summer in the course of a 350-mile motor trip through Utah, Nevada, and Oregon. The trip covered the period from July 20 to August 8, 1941. All raptors sighted from the car were tallied. The daily totals appear in figure 11. Leo K. Couch and J. Paul Miller helped make the tally.

The tally varied from none to 98 raptors per day, and averaged one raptor for each 10 miles of daylight travel. The tally does not include vultures, and it omits owls seen by headlights at night.

The daily totals show five concentration areas, all of which were on state or federal refuges, and all of which showed good stands of grass. These were the only areas of well grassed open country we saw. Most of the intervening terrain was overgrazed and devoid of perennial grasses, and it was devoid of visible raptors.

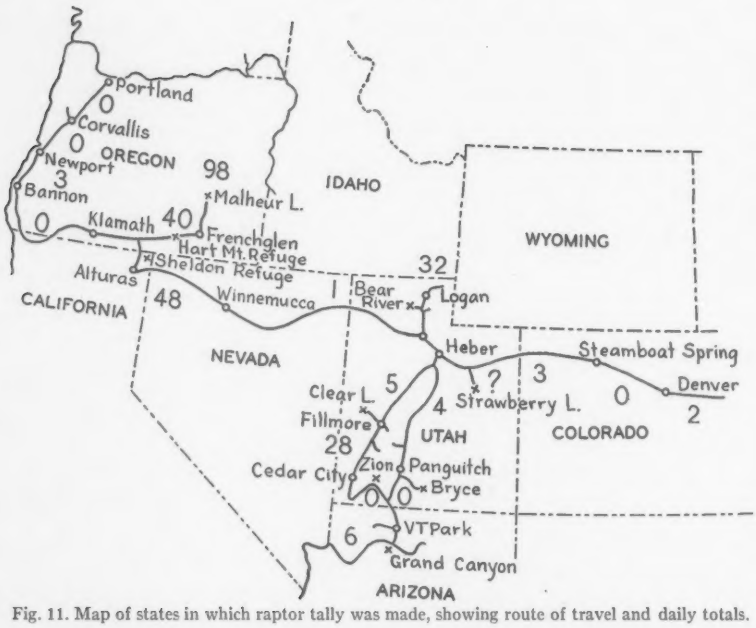

Fig. 11. Map of states in which raptor tally was made, showing route of travel and daily totals.

The highest daily tally was on the Malheur Waterfowl Refuge, Harvey County, Oregon. It included 31 Marsh Hawks, 37 Swainson Hawks, 14 Short-cared Owls, a few Sparrow Hawks and Red-tails, and a Prairie Falcon.

On the Hart Mountain Antelope Refuge, Lake County, Oregon, we encountered an extraordinary concentration of Short-eared Owls. In 16 miles of night-driving between Hart Mountain and French Glen, Leo Couch tallied 320 Short-ears. The same 16 miles, plus some additional mileage, yielded 37 by daylight. These owls evidently had gathered to feed on a high population of mice, and presumably had gathered on the road at night to catch mice crossing in the open.

The total daytime tally of 294 raptors seen during the trip breaks down by species as follows:

Sparrow Hawk	87	Ferruginous rough-legged Hawk	7
Marsh Hawk	58	Goshawk	3
Swainson Hawk	48	Duck Hawk	1
Short-eared Owl	37	Prairie Falcon	1
Buteos, unidentified	33	Burrowing Owl	1
Red-tailed Hawk	18	Total	294

No Horned Owls were seen alive, but frequent dead ones, apparently juveniles, were noted along highways, especially in cuts on hilltops. The owls, scavenging on motor-killed rabbits, could not, in such locations, note the approach of cars from a distance. The walls of the cut probably further handicapped their escape.—ALDO LEOPOLD, *Madison, Wisconsin, October 25, 1941.*

A Second Record for the Calaveras Warbler in the State of Montana.—To date, so far as known, there is only one record of the Calaveras Warbler (*Vermivora ruficapilla ridgwayi*) in Montana (see Saunders, Pac. Coast Avif. No. 14, 1921:145), and none from Gallatin County (Saunders, Auk, 28, 1911:26-49). It seems worthwhile, therefore, to record the collecting of another representative of this species in the state. The bird, an adult female, was captured at 9:30 p.m., September 22, 1941, after it had flown through an open window into a lighted room at Bozeman, Gallatin County. It is now no. 532 in the collection of Montana State College, Bozeman, Montana.—ROBERT W. HIATT, *October 3, 1941.*

An Oligocene Hawk from Colorado.—In 1937, while collecting in the White River deposits of northeastern Colorado, a field party from the Museum of Paleontology of the University of California obtained part of the tarsometatarsus of a large hawk. The bone was taken from the Oreodon beds which are of Middle Oligocene age.

The description of *Palaeoplancus sternbergi* (Wetmore, Smithsonian Misc. Coll., 87, 1933:1-9), a large raptorial bird from the Oligocene of Wyoming, seemed to indicate possible relationships of the newly found fossil to that form. In the course of a recent visit to Washington, D.C., the junior author was enabled to examine the type of *Palaeoplancus* through the kindness of Dr. Alexander Wetmore of the U. S. National Museum. Comparison with the White River fossil showed the two to be fundamentally different. As suggested by Dr. Wetmore, the bone has the characters of the genus *Buteo* in its broadest sense and is best allocated to that group. In general the fossil is more different from typical *Buteo* than are the aberrant buteonids, such as those of the *Geranoaëtus* group. Nothing is gained, however, by erecting a new genus. This form is therefore placed in *Buteo* and may be known as

Buteo fluviaticus, new species

Characters.—Compared with *Palaeoplancus sternbergi*, the scar of the hallux on the tarsometatarsus extends much higher on the shaft, and the blade of the inner trochlea is more produced posteromedially. The body of the inner trochlea in *B. fluviaticus* is heavier and the condylar region in general is more massive.

Fig. 12. Tarsometatarsus of *Buteo fluviaticus*, natural size. Above, plantar aspect; below, distal aspect of trochleae (drawings by Viola Memmler).

The modern *Buteo melanoleucus* [variously classed at times in *Spizastur*, *Spizaëtus* and *Geranoaëtus*] was found to provide excellent comparative material. It is of the same general type as *B. fluviaticus* and has been used by Wetmore in comparing other extinct forms, namely, *Buteo contortus*, *B. coterminus*, *B. grangeri* and *B. ales*. In addition, it was found that the type of *B. fluviaticus* was of exactly the same size in gross measurements as a specimen of *Buteo melanoleucus* (U.S.N.M. no. 18471).

The scar of the hallux of *B. melanoleucus* is more restricted and does not extend as far proximally as in *fluviaticus*. The inner and middle trochleae are of unequal length in *B. melanoleucus* but are equal in *B. fluviaticus*. The middle trochlea is stouter in all respects in *fluviaticus* than in *melanoleucus*. The posterior plate or flange of the outer trochlea is more incurved when viewed distally in *melanoleucus* than in *fluviaticus*. The White River fossil has a well marked intermuscular line on the outer face of the external trochlea, extending from the posterior edge of the shaft toward the center of the trochlea. This line is present in *Palaeoplancus* but is nearly absent in *Buteo melanoleucus*. The flange of the inner trochlea is more recurved toward the midline in *B. melanoleucus*.

Similar differences are found in comparing the fossil with smaller forms such as *Buteo borealis*.

Type.—Distal third of right tarsometatarsus (see fig. 12), no. 36266 Univ. Calif. Mus. Paleo., from locality V-3743, Chalk Bluffs, Oreodon beds, Roy Elum Ranch on Owl Creek, R 66 west, T 11 north, six miles east of Carr, Weld County, Colorado.

Measurements in millimeters.—Greatest width across condyles, 19.9. Distance from proximal end of metatarsal facet to most distal point on internal condyle, 26.4. Width of middle trochlea, 5.8. Transverse diameter of shaft at proximal end of metatarsal facet, 9.2.

Remarks.—Buteo grangeri (Wetmore and Case, Contr. Mus. Paleo. Univ. Michigan, 4, 1934:129) is from the same horizon as *B. fluviaticus* but is known only from the skull. The relative size of the elements is similar and it is not impossible that they are of the same species. Until the skull and tarsus are found together, however, both names must be employed.

Buteo typhoius (Wetmore, Bull. Am. Mus. Nat. Hist., 48, 1923:489-492), from the Upper Miocene differs from *B. fluviaticus* in possession of a distinct groove on the anterior face of the shaft which extends nearly to the internal trochlea. This area in *fluviaticus* is flat and lacks any suggestion of such a groove.

Buteo contortus (Wetmore, *op. cit.*: 492-497) is somewhat larger than *fluviaticus*; it is 23 mm. across the trochlea as compared with 19.9 mm. *Contortus* is described as being "similar to . . .

Geranoaëtus melanoleucus but larger, and relatively more robust." Since *fluviaticus* is the same size as *Buteo* (*Geranoaëtus*) *melanoleucus*, it follows that *B. contortus* is larger than *fluviaticus*. Regardless of size, *contortus* has a longer first trochlea (digit II) than *fluviaticus*.

Buteo coterminus (Wetmore, *op. cit.*: 497-499) differs from *B. fluviaticus* in having a more massive inner trochlea and in larger size.

Buteo ales (Wetmore, Ann. Carnegie Mus., 16, 1926:403) from the Miocene is smaller (16.2 mm. across condyles) than *B. fluviaticus*. The illustration accompanying the description of *ales* shows no indication of an intermuscular line on the outer face of the external trochlea as in *fluviaticus*.

Buteo antecursor (Wetmore, Bull. Mus. Comp. Zool., 75, 1933:298-300) from the Upper Oligocene is somewhat smaller (18.1 mm. across condyles) than *fluviaticus* and differs among other things in its convex rather than straight lateral contour of the outer metatarsal. However, *antecursor* seems to have many characters which parallel those of *fluviaticus*. The metatarsal facet is relatively long and extends far up the shaft. The second trochlea is also more massive than in later forms such as *B. ales*. In these respects the Oligocene species resemble each other. This suggests a line of development from the older to the more recent types.

Buteo dananus (Marsh, Amer. Jour. Sci., ser. 3, 2, 1871:125) was described from a tibiotarsus. It is smaller than *B. melanoleucus*.

In the same quarry with the type of *fluviaticus* was a well preserved proximal third of a femur representing a hawk of the same size as the type. This femur is exactly the same size as the corresponding element in *B. melanoleucus*. It is therefore referred to *B. fluviaticus* but since it is lacking in diagnostic characters, it is not included in the description. The following list serves to review the relative position in the geologic time scale of the several species of *Buteo* from the Tertiary of North America.

Lower Pliocene	*Buteo coterminus*
Upper Miocene	*B. contortus, B. typhoius,*
Lower Miocene	*B. ales*
Upper Oligocene	*B. antecursor*
Middle Oligocene	*B. grangeri, B. fluviaticus*

—Alden H. Miller and Charles G. Sibley, *Museum of Vertebrate Zoology, Berkeley, California, December 5, 1941.*

Black Swift in Orange County, California.—About five o'clock on August 10, 1941, and again at about the same time on the following day, I saw a single Black Swift (*Nephoecetes niger*) flying high in a southeasterly direction over a bluff at Corona del Mar, Orange County, California. This is a sight record but I feel very sure of my identification.—Wilson C. Hanna, *Colton, California, September 4, 1941.*

Whooping Cranes in Texas in Summer.—The Whooping Crane (*Grus americana*) is a regular winter resident of the Aransas National Wildlife Refuge, Aransas and Refugio counties, Texas. A few also spend the winter in salt marshes and along bay shores of other sections of these counties and in Calhoun County. Extreme dates of occurrence on the refuge, up to this spring, are October 21 (1938 and 1939) and May 6 (1939).

It was therefore a surprise to note that one of our wintering family groups was still present on the refuge's east shore flats near Mullet Bay, Aransas County, on May 16, 1941. This group consisted of two adults with their single young, apparently hatched in 1940. The birds have been observed frequently since then in the same general area and are still here (October 10). Courtship of the adults was noted by Everett Beaty and the writer on May 16 and as late as May 23. No evidence of nesting was observed.

This family formed part of a group of 26 birds (21 adults and 5 immatures) which spent the winter of 1940-1941 on the Aransas National Wildlife Refuge. It is possible that some of these were birds which would normally remain in Louisiana in winter. Mr. John J. Lynch (in litt., September 10, 1941) states: "Our Louisiana cranes were badly scattered by high water last fall [1940]. Flood water stood three and four feet deep over most of their range from August until late October, and never did drop down to normal until this summer. Concensus of opinion is that most of the birds 'went down the Texas Coast.'"

The only other definite summer record for the State, which I can find, is also for the Gulf coast of southern Texas. Bent (U. S. Nat. Mus. Bull. 135, 1926:229) quotes Mr. Richard M. Kleberg as stating that there were, in 1919, 16 cranes on the King Ranch, in Kleberg County, which grew from a flock of 3 which bred there. Bent makes the comment that there is no positive evidence of their

breeding in that locality but that some birds do remain there throughout the year. The latitude of the refuge area (28° 10′) in which cranes spent the summer is farther south than the region in southern Louisiana in which Whooping Cranes are resident birds. There are persistent reports that Whooping Cranes have nested and reared young in the marshes of Vermilion Parish but additional information is needed to verify this.

The number of cranes on the refuge has steadily increased over the past three years. However, if the ratio of adults to young is any index of the status of the species as a whole, the outlook for the survival of the Whooping Cranes is most discouraging as proportionately fewer immature birds arrive on the Texas coast each autumn. Mr. Lynch believes that the status of cranes in Louisiana is none too favorable even though many of the birds may be non-migratory. Adults are in constant danger of being driven out of the White Lake marshes by natural factors, such as floods, and thus being forced to move to near-by prairie lands where they are exposed to illegal hunters.—JAMES O. STEVENSON, *U. S. Fish and Wildlife Service, Austwell, Texas, October 10, 1941.*

Trade Value of the Beak of the Ivory-billed Woodpecker.—In the Condor for July, 1939 (p. 164), A. M. Bailey notes the finding of a beak of an Ivory-billed Woodpecker (*Campephilus principalis*) in an Indian grave in Colorado and correctly assumes that it must have been made available through trade channels. It is of interest to recall the probably basic statement on this subject by Mark Catesby (Nat. Hist. Carolina, etc., 1791, 1:16: the original edition was published from 1731 to 1743). He wrote: "The bills of these birds are much valued by the Canada Indians, who make coronets of them for their Princes and great warriors . . . . The Northern Indians, having none of these birds in their cold country, purchase them of the Southern people at the price of two, and sometimes three buck-skins a bill." Buffon and others have drawn upon this statement for their references to the subject.—W. L. MCATEE, *Wildlife Service, Washington, D.C., October 22, 1941.*

Starlings in Southern Utah.—On January 2, 1941, a large flock of Starlings (*Sturnus vulgaris*) was seen at Mt. Carmel, Kane County, Utah. It was estimated that the birds numbered approximately 200. That afternoon when I again passed through Mt. Carmel I looked for them, but could find no trace of the flock. Apparently the birds were drifting and had gone on down the valley.—RUSSELL K. GRATER, *Zion National Park, Utah, October 25, 1941.*

Golden Eagles Visit Northern Arizona Desert.—On a visit to Grand Canyon National Monument, September 23 to 26, 1941, a total of eight Golden Eagles (*Aquila chrysaëtos*) and one Bald Eagle (*Haliaeetus leucocephalus*) were seen, indicating a definite fall movement of these birds to desert areas. When descending the Kaibab Plateau going from Jacobs Lake to Fredonia on September 23, we saw a dead Golden Eagle which had been shot. Wing feathers were obtained as evidence. Crossing the desert toward Fredonia, we saw a mature (white head and tail) Bald Eagle in flight. Returning over the same route next day a Golden Eagle was seen in flight over the desert near Fredonia and another one between Pipe Springs and the Grand Canyon National Monument. Another was seen soaring above the cliffs of Toroweap Valley that afternoon.

Returning from Toroweap Valley to Fredonia on the 24th we noted a Golden Eagle in flight and heard it call, then noted a second one. Both alighted in the top of a piñon pine a couple of hundred yards away. They took flight before a photograph could be taken. Nearer Pipe Springs another was seen in flight and still another very large one was observed perched on a rock on open sagebrush desert. On September 25 one was seen in flight and another perched on a telephone post in similar desert surroundings near Fredonia. Certainly here was evidence of a fall movment of eagles from their usual mountain habitats to open sagebrush desert. Their low flight and low perching places indicated a diligent search for rodent prey. On this trip Marsh Hawks (*Circus hudsonius*) were also unusually abundant. September also brought several records of the Golden Eagle for Grand Canyon. —HAROLD C. BRYANT, *Grand Canyon, Arizona, October 5, 1941.*

NOTES AND NEWS

The sixteenth annual meeting of the Cooper Ornithological Club has been planned for the spring, probably in late March or in April, in San Diego, California. Recent inquiry of Clinton G. Abbott assures us of the continued desire of the Natural History Museum there to play host to the Club. In spite of war-time conditions it is reported that we can carry forward our scientific program and that out-of-town members can be taken care of. Perhaps one of the chief duties of those not actively drawn into defense work is to maintain and advance our scientific and scholarly institutions, thus preserving these things which have been destroyed or unrecognizably altered in many sections of the world. We admire Mr. Abbott's urge to carry on, and all members who can should plan to participate in the annual meeting.

We learn with deep regret of the passing of Charles Michael on December 30, 1941. He was an acute and understanding observer of animals, who wrote but a fraction of what he knew and yet contributed a number of excellent articles on California bird-life, particularly of the Yosemite Valley. The names of the Michaels have correctly become a tradition in the natural history of the Yosemite. We can but reflect poignantly on early trips afield with Charles Michael and on the complete satisfaction and comfort he took in the out-of-doors, attitudes which happily were imparted to his companions.—A. H. M.

Readers of the Condor are already familiar with some of the early experiences of the Lofberg's at Florence Lake, in the southern Sierra Nevada. A more extensive story of the growth of their alliance with the wild creatures which came to them is now available in a book. The change in attitude of two persons, snowbound two-thirds of the year, from uncertain suspicion and antipathy toward wild animals to sympathetic understanding and active concern with their problems is traced. The coyotes provide such a remarkable plot that a reader, once started, follows it to the end. The book, Sierra Outpost, by Lila Lofberg and David Malcolmson, was issued in 1941 by Duell, Sloan, and Pearce, Inc., New York.—J. M. L.

To our surprise and pleasure, the fifth and final volume of the highly important Handbook of British Birds (London, H. F. & G. Witherby) has made its appearance on schedule, so far as we can judge. It was issued in September of 1941, little more than a year following the fourth volume. The authors, Witherby, Jourdain, Ticehurst and Tucker, in this last section deal with the Lari, Alcae, Ralliformes and Galliformes. British birds may seem a remote subject to western ornithologists, but the general values in this handbook for any serious student of birds of the northern hemisphere can not be too highly stressed.—A. H. M.

It is not as a rule necessary to review articles appearing in other ornithological journals readily accessible to readers of the Condor. However, scientific conscience compels us to comment on one aspect of a recent paper by A. M. Woodbury entitled "Animal Migration—Periodic-Response Theory" (Auk, 58, 1941:463-505). This survey of migration may be useful to those not well read in the field but it is marred by unwarranted claims of novelty for the ideas set forth in the discourse. Antecedent books and articles by numerous competent writers in the fields of migration and periodicity have provided the ingredients and essentially the synthesis of the concept that is offered.—A. H. M.

PUBLICATIONS REVIEWED

A continuation of Ridgway's "Birds of North and Middle America" is now before us in tangible form as Part 9 of this work (U. S. Nat. Mus. Bull. 50, Part IX, 1941 [our copy received October 28]: ix + 254 pp., 16 figs. in text; 40 cents). This volume has been completed by Herbert Friedmann who has utilized in so far as possible the diagnoses and synonymies left in manuscript form by Ridgway, and by Charles W. Richmond who contributed to these phases of the first eight volumes. In spite of the use made of earlier material and the co-authorship of Ridgway and Friedmann, Part 9 is likely to become known, correctly, as Friedmann's work built on Ridgway's plan. Part 9 is less than half the size of the smallest of preceding sections and includes treatment of only four relatively small groups: the cranes (Gruidae), the rails (Rallidae), the sun-grebes (Heliornithidae) and the sun-bitterns (Eurypygidae). Friedmann explains that he reduced the size of the volume to permit immediate publication. We take this to mean that its total scope was reduced but that there were no reductions within the accounts of individual species.

Although the plan of the work is like that of the preceding part issued 22 years ago, there are a few innovations. A distinct improvement is the placement of drawings of heads, wings and

feet in the text with the accounts of the species to which they pertain rather than at the end of the volume. Likewise an improvement is the use of many more specimens, when available, for calculation of average measurements of races. Thus, Friedmann has broken away from the statistically fallacious attitude of Ridgway, who seemed content with averages based on a "standard" ten or a dozen specimens. The organization of the statement of range into paragraphs dealing separately with breeding range, winter range, and casual occurrences is new and helpful. One change that is not an advance in our opinion is elimination from the keys of parenthetical indications of geographic range.

The lists of literature in the synonymies become astoundingly lengthy as a result of the wealth of ornithological publication in the last few decades. For example, the listings for a common species like the American Coot take up six pages of fine print. These bibliographies, although not entirely complete, are of inestimably high value.

The vernacular names of races that are employed usually reflect the specific relations of the bird and consequently in a number of instances, as with the Clapper Rails, improve upon the A.O.U. Check-list of 1931. But why this improvement has not been made uniformly is puzzling. Thus, quite logically, the "Light-footed Rail" of southern California becomes the Light-footed Clapper Rail; but the subspecies of *Grus canadensis* remain little Brown Crane, Sandhill Crane, Florida Sandhill Crane (Florida Crane of the Check-list) and Cuban Sandhill Crane, and the Black Rails (*Laterallus* [*Creciscus*] *jamaicensis*) are named Eastern Black Rail, Farallon Rail(!) and Jamaican Black Rail. Incidentally, the "Farallon Rail" has not been known to breed on the Farallon Islands, as is implied (p. 157), nor is it at all likely that it would do so. A name for this race that is much more fitting and which has had wide use in the West is California Black Rail.

Friedmann's taxonomic treatment of the cranes and rails of the Pacific coast of North America agrees with that of Peters (Check-list of the Birds of the World, 2, 1934), with one exception. The Pacific race of the Virginia Rail (*Rallus limicola zetarius* Peters, known formerly as *Rallus virginianus pacificus* Dickey) is shown to be unworthy of recognition as a result of a survey of its supposed characters of size. The Clapper Rails of the salt marshes of both sides of North and Central America are united in one species (*Rallus longirostris*), we think correctly, by both Peters and Friedmann.

The successful efforts of Friedmann to continue the Ridgway volumes, in which he incorporates his own good judgment and experience, will find ready appreciation among North American ornithologists.—Alden H. Miller.

MINUTES OF COOPER CLUB MEETINGS

SOUTHERN DIVISION

SEPTEMBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held at the Los Angeles Museum on Tuesday, September 30, 1941, with President Hildegarde Howard in the chair and about 50 members and guests present. The minutes of the August meeting were approved as read. The following applications for membership were read: Miss Julianne G. Bayliss, 1206 W. 70th St., Los Angeles, Calif., proposed by Dr. Hildegarde Howard; Mr. R. Elmer Belt, 1893 Wilshire Blvd., Los Angeles, Calif., proposed by Dr. Loye Miller; Mrs. Frances F. Roberts, Encinitas, Calif., Mr. Cecil A. Poole, 830 Chapman St., San Jose, Calif., and Walter A. Ross, 626 W. Caldwell St., Compton, Calif., proposed by W. Lee Chambers.

Under new business, Mr. Chambers announced the purchase of a new screen which was to become the property of the Cooper Club and was paid for by generous members.

President Howard then presented the speaker of the evening, Dr. Loye Miller, who gave a most interesting lecture entitled "Studying Nature by Sound." The meeting was then opened to discussion. Under observation Mrs. M. F. Coble mentioned seeing 50 Wood Ibis, many stilts, egrets, and cormorants at the Carlsbad sloughs.

George Willett gave a detailed and comprehensive report on the 1941 A.O.U. meeting held in Denver, Colorado. Mr. H. P. Davis raised the question pertaining to the revoking of scientific collecting permits and the likelihood of their renewal. George Willett and R. T. Moore made comments but could not answer the questions.

Adjourned.—IRWIN D. NOKES, *Secretary*.

OCTOBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held at the Los Angeles Museum on Tuesday, October 28, 1941, with President Hildegarde Howard in the chair and about 75 members and guests present. The minutes of the September meeting were approved as read. The following applications for membership were read: Gordon D. Alcorn, Grays Harbor College, Aberdeen, Washington, proposed by Dr. Alden H. Miller; Luther C. Goldman, P. O. Box 1242, Brawley, Calif., proposed by Alvin W. Elder; James Boswell Young, 2516 Talbott Ave., Louisville, Kentucky, and Ruth M. Price, 315 El Nido, Monrovia, Calif., proposed by W. Lee Chambers.

Dr. Howard then introduced the speaker of the evening, Dr. Clinton G. Abbott, who gave an illustrated lecture entitled "The Lure of Lower California."

The meeting was then opened to discussion and observations. W. A. Kent asked if there were any condors in Lower California. Lawrence Peyton answered in the affirmative, stating that they have been reported by Mrs. Solve Melling who lives at Rancho San Jose via San Telmo, Baja California, Mexico. Howard Cogswell reported seeing a Great Gray Owl on the Glacier Point Road in Yosemite, on September 17, 1941.

Adjourned.—IRWIN D. NOKES, *Secretary*.

NORTHERN DIVISION

OCTOBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, October 23, 1941, at 8:00 p.m., in Room 2503 Life Sciences Building, Berkeley, with President E. Lowell Sumner, Jr., in the chair and 37 members and guests present. Minutes of the Northern Division for September were read and approved. One proposal for membership was received: Mrs. C. D. Shane, 89 San Mateo Road, Berkeley, Calif., by Alden H. Miller.

Mr. Miller had found evidence of the nesting of Wood Ducks at Waddell Creek, Santa Cruz County; young ones not yet flying were present on September 15. Mr. Lowell Sumner said that Wood Ducks had nested for several years at Peters' Creek Pond, near the Skyline Boulevard and Alpine Creek Road. Milton Seibert reported a Lewis Woodpecker near Mills College, October 5.

Mr. Robert T. Orr, of the California Academy of Sciences, San Francisco, spoke on "The Behavior of Captive Galapagos Finches." Mr. Orr has had the opportunity of studying the finches secured in the Galapagos by David Lack, for the Zoological Society of London, early in 1939. Since it seemed inadvisable to attempt taking the birds to London at that time, they were offered to the California Academy. Mr. Kinsey housed the birds in his aviaries at Manor, Marin County, until proper facilities could be built at the academy, and gave invaluable advice on their feeding and care.

Subsequent survival has been excellent among the birds which were able to stand the trip, and 20 of the original 30 are still living, mostly of the species *fuliginosa* and *scandens*. Breeding has been successful, so that no difficulty has been experienced in maintaining the numbers of the more numerous species. All phases of the breeding cycle have been studied in detail by Mr. Orr.

Adjourned.—FRANCES CARTER, *Recording Secretary*.

NOVEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, November 27, 1941, at 8:00 p.m., in Room 2503 Life Sciences Building, Berkeley, with President E. Lowell Sumner, Jr., in the chair and 45 members and guests present. Minutes of the Northern Division for October were read and approved. Minutes of the Southern Division were read. One application for membership was read: Le Von Lee, 721 Connelley Street, Clovis, New Mexico, proposed by R. Frank Hedges (April 29, 1941). The president announced that the next meeting would fall on the third Thursday of the month, December 18.

Frank Watson reported a White-throated Sparrow in full song, at Burlingame, San Mateo County, November 16. Mr. Covell brought several news items from Lake Merritt in Oakland. A new color-banded California Gull had appeared, with the combination used at Salt Lake, Utah. Pintail Ducks were learning to dive after the manner of the Canvas-backs. The American Egret was continuing its practice of last year of catching English Sparrows. Mr. Alden Miller had been discussing California Woodpecker populations with Dr. Ritter. An unusually large number of this species has been observed this season on the west side of the Berkeley Hills, and Mr. Miller asked for specific observations regarding the acorn crops, since moths have damaged the trees extensively east of the hills. Mr. Emlen had noted that in the Sacramento Valley the blue oaks produced almost no acorns this year, whereas the crop on the valley oaks was normal. Mrs. Allen commented on the numbers of Lewis Woodpeckers reported recently, especially in the area from Sunol to north of Orinda. The albino grebe at Dumbarton Bridge was present for the fourth consecutive season.

"Exploring the Ranges of Birds in Oregon" was the subject presented by the speaker of the evening. Mr. Alden Miller gave an account of the results of four summer field trips made by the Museum of Vertebrate Zoology into Oregon in the last nine years. Five major avifaunal groups may be separated, following the principal geographic features of the state: (1) the coast assemblage, along the coastal strip of hills and lowlands, (2) the montane or higher mountain group, on the high peaks separated by low gaps, (3) the Great Basin group, east of the Sierra-Cascade axis, (4) the Sonoran group, in the oak association, (5) the transcontinental or eastern group, which owes its presence in part to the mountain ranges making a fairly complete link with the Rockies. Examples of each group were discussed, and a vivid picture of the field work, including the adventures of owl hunting, was given.

Adjourned.—FRANCES CARTER, *Recording Secretary*.

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Catalogue of an exhibition of paintings by American Bird Artists, First Annual Meeting, Los Angeles Museum, April, 1926; 24 pp. - - - - - - - - - - $ .50

Catalogue of the work of Major Allan Brooks shown in connection with the third annual meeting of the Cooper Ornithological Club May 4-6, 1928, under the auspices of the San Diego Society of Natural History, Fine Arts Gallery, Balboa Park, San Diego, Calif.; 10 pp. - - - - - - - - - - - - - - - - $ .25

Catalogue of an exhibition of bird paintings by Lynn Bogue Hunt, sponsored by the Southern Division of the Cooper Ornithological Club at the Los Angeles Museum, April, 1929; 16 pp., portrait of Lynn Bogue Hunt, and 7 half-tones - - - - - - - - - $ .25

An exhibition of scientific drawings by John Livzey Ridgway, shown by the Los Angeles Museum, on the occasion of the Fifth Annual Meeting of the Cooper Ornithological Club - - - - - - - - - - $ .25

Catalogue of an exhibition of original water colors by Major Allan Brooks, shown under the auspices of the Cooper Ornithological Club, Los Angeles Museum, April, 1936 (Eleventh Annual Meeting of the C. O. C.); 15 pp. and 9 half-tones, including one of Major Brooks - - - - - - - - - - - - - - - $ .25

Other Publications

The Story of the Farallones, 1897; 36 pp., 28 ills. $ .10
By C. BARLOW

Report of the Birds of Santa Barbara Islands. Pub. No. 1, Pasadena Acad. Sci., August, 1897; 26 pp. - $1.00
By J. GRINNELL

Birds of the Pacific Slope of Los Angeles County. Pub. No. 2, Pasadena Acad. Sci., March, 1898; 52 pp. $ .25
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